

Welfare of sea lions in travelling circuses

Hans Hopster
Ingrid de Jong

LIVESTOCK RESEARCH
WAGENINGEN UR

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Corresponding author: hans.hopster@wur.nl

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Samenvatting
Dit rapport geeft een overzicht van de wetenschappelijke literatuur en opinies van deskundigen over het welzijn van zeeleeuwen in reizende circussen. Dit als basis voor beleidsontwikkeling.

Summary
This report describes the scientific literature and expert views concerning the welfare of sea lions in travelling circuses with respect to Dutch animal welfare policy making.

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Inhoud

Preface

This study evaluates the scientific findings and the prevailing expert opinions on the welfare of sea lions in travelling circuses. The use of sea lions in circuses is part of a public debate that should include the pro's and con's based on empirical data and expert opinions. I expect this report to support policymakers and politicians in making a careful and transparent decision on whether or not to allow the use of sea lions in travelling circuses.

Hans Hopster

Samenvatting

Doelstelling: Deze relatief beperkte studie is uitgevoerd om inzicht te krijgen in de literatuur en de bevindingen van deskundigen met betrekking tot het houden, trainen en optreden van zeeleeuwen in reizende circussen en de consequenties daarvan voor hun gezondheid en welzijn.

Methoden: Een literatuuronderzoek is aangevuld met een raadpleging van deskundigen. In totaal werden 20 deskundigen bevraagd aan de hand van een uitgebreide (n = 7), dan wel een beperkte (n = 13) vragenlijst.

Gedrag in gevangenschap: Zeeleeuwen die in circussen optreden zijn meestal Patagonische of Zuid-Amerikaanse zeeleeuwen (*Otaria flavescens*) en Californische zeeleeuwen (*Zalophus californianus*). Er zijn geen empirische studies gevonden naar het welzijn en de gezondheid van zeeleeuwen in reizende circussen. Enkele perifere en casestudies over anderszins gehouden zeeleeuwen (dierentuin, dolfinarium) wijzen op mogelijke welzijnsproblemen als oogaandoeningen, regurgiteren en stereotiep zwemmen. Een gebrek aan complexiteit en stimulatie, onvoldoende verzadiging, een relatief klein bassin en overmatige blootstelling aan ultraviolette stralingzijn geïdentificeerd als potentiële gevaren voor het welzijn van gehouden zeeleeuwen. In vergelijking met een dierentuin omgeving, spreekt een circus omgeving waarschijnlijk de cognitieve capaciteiten van de dieren nadrukkelijker aan, vanwege de meer aanwezige en meer gevarieerde stimuli. Daartegenover staan in een reizend circus de beperktere dimensies van het bassin. Vanwege de bijzondere omstandigheden in een reizend circus, zijn bevindingen over zeeleeuwen in dierentuinen en dolfinaria niet zondermeer van toepassing op zeeleeuwen in reizende circussen. Volgens deskundigen, hebben zeeleeuwen in circussen een maximale levensverwachting van 25-30 jaar.

Soortspecifiek gedrag : Zeeleeuwen hebben een relatief groot aanpassingsvermogen en sterk ontwikkelde zintuigen. Het zijn semi-aquatische en opportunistische vleeseters die in complexe sociale en fysieke omgevingen leven waar ze ruim tijd besteden aan zwemmen, duiken en foerageren op onregelmatig verspreid levende prooidieren. Omdat zeeleeuwen niet kunnen zweten of hijgen, gebruiken ze hun omgeving voor thermoregulatie. Afhankelijk van de beschikbaarheid van voedsel, migreren zeeleeuwen niet en duiken ze, afhankelijk van de waterdiepte, diep of minder diep. Tijdens foerageertochten brengen zeeleeuwen de helft van hun tijd door op zee, de overige tijd vertoeven ze in zogenaamde ‘haul-out’ gebieden waar ze tijdelijk op het droge verblijven. Zeeleeuwen hebben sterk ontwikkelde zintuigen voor het opsporen van prooidieren, met name onder omstandigheden onder water met weinig licht. Hun ogen zijn aan deze lichtarme onderwateromstandigheden anatomisch aangepast. Zeeleeuwen kunnen geuren detecteren en onderscheiden. Neus-aan-neus contact is belangrijk bij de sociale communicatie en herkenning. De maximale levensverwachting van zeeleeuwen in het wild is 16-20 jaar voor mannetjes en 25 jaar voor vrouwtjes.

Zienswijzen van deskundigen: In totaal droegen 20 deskundigen bij aan het inzicht in diverse aspecten van het houden van zeeleeuwen in circussen. Zeven deskundigen vulden hiervoor een uitgebreide vragenlijst in, resulterend in onderstaande beschrijving van de huidige praktijk van het houden van zeeleeuwen in reizende circussen. Andere experts werden gevraagd naar hun algeheel oordeel over het welzijn van zeeleeuwen in reizende circussen, naar de grootste welzijnsrisico’s en naar hun aanbevelingen voor verbetering. Van de twaalf experts die hun visie op de algehele welzijnsstatus gaven, scoorden zes experts op een tien-punts-schaal vanaf 5,5 naar boven en zes deskundigen scoorden vanaf 5,5 naar beneden. De antwoorden van de experts illustreren een markant verschil in de algehele beoordeling van het welzijn van zeeleeuwen in reizende circussen.

Huisvesting: Zeeleeuwen in reizende circussen hebben een bassin in een transportwagen (15m^3), een groot bassin (50m^3) en een schaduwrijk ‘haul-out’ (rust) gebied. Het water in het overdekte bassin (in de truck) wordt regelmatig ververst en het water wordt gefilterd met behulp van een zandfilter. De dieren leven meestal in kleine stabiele familiegroepen (< 5 dieren) en krijgen ongeveer 6 kg kwalitatief goede vis per dag met de hand gevoerd in meerdere porties (bijvoorbeeld 3-4 keer per dag).

Transport: Zeeleeuwen worden overwegend droog vervoerd (geen water in het bassin) en liggen vrij in de transportwagen. Zeeleeuwen in reizende circussen worden in Nederland waarschijnlijk meestal vervoerd over korte tot middellange afstanden (tot enkele honderden kilometers). Vanwege het reizende karakter van de circussen, zijn

zeeleeuwen aan vervoer gewend mits er goede faciliteiten beschikbaar zijn (goed geïsoleerd voertuig met weinig trillingen en een goed ingelichte, verantwoordelijke bestuurder). Reizende circussen hebben meestal een ' winterstop'.

Training, optreden en mens-dier relatie: Zeeleeuwen in reizende circussen worden getraind met behulp van doelgerichte training, die in feite impliceert dat beloning met voedsel primair wordt gebruikt als bekrachtiger. Honger is niet aan de orde, ook al wordt wel gelet op behoud van een trainingsgewicht. Zeeleeuwen treden doorgaans tweemaal per dag op gedurende 8-10 minuten, maar in bijzondere gevallen kan dit oplopen tot vier keer per dag. Experts benadrukken het belang van flexibele shows met variatie in frequentie en herhaling. Circus zeeleeuwen zijn waardevol voor hun eigenaren, economisch maar ook gevoelsmatig. Binnen de beperkingen van het circus krijgen zeeleeuwen daarom waarschijnlijk de best mogelijke zorg.

Richtlijnen en transparantie: Veel landen hebben wettelijk bindende welzijnseisen voor zowel dierentuinen als circussen. Dit is meestal in de vorm van vergunningen die periodieke controle vereisen door personen die ervaring hebben op het gebied van dierenwelzijn en in het algemeen in dienst zijn van de overheid. Vergunningen worden alleen verleend indien wordt voldaan aan de gestelde voorwaarden. Het niet hebben van een vergunning wordt wettelijk gesanctioneerd door boetes of zelfs door inbeslagname van dieren.
Bestaande Duitse en Britse richtlijnen voor het houden van zeeleeuwen in circussen vormen een uitgangspunt voor het waarborgen van een minimum niveau van welzijn voor circus zeeleeuwen. Richtlijnen bevatten de best mogelijke beschrijving van wat wordt beschouwd als een adequate huisvesting en verzorging, nodig voor de naleving van aanvaardbare welzijnsnormen voor zeeleeuwen in circussen. Het opstellen van richtlijnen impliceert echter ook compromissen tussen dierbelangen en haalbare houderijsystemen die voor wat betreft de details niet altijd wetenschappelijk onderbouwd kunnen worden.

Conclusie: De deskundigen zijn het grotendeels eens over de belangrijkste bedreigingen (risico's) voor het welzijn van zeeleeuwen in reizende circussen. Bassin afmetingen, ruimte, sociale omstandigheden, voedsel- en waterkwaliteit werden genoemd als de top-vijf mogelijke oorzaken voor welzijnsproblemen. Deze factoren lijken verband te houden met de relevante kenmerken van de natuurlijke habitat van de zeeleeuwen en de beperkingen die door het houden van zeeleeuwen in een circus omgeving aan het dier worden opgelegd. Ondanks de overeenstemming over de belangrijkste bedreigingen, beoordeelden de deskundigen de werkelijke algehele welzijnstoestand van zeeleeuwen in reizende circussen sterk verschillend.

In hun beoordeling van de algehele welzijnstoestand van zeeleeuwen hebben de experts waarschijnlijk verschillende referentiekaders gebruikt. Wij veronderstellen dat de ingenomen posities op de tien-punts-schaal beïnvloed zijn door ten minste de volgende drie dimensies: 1) opvattingen over een aanvaardbaar niveau van dierenwelzijn, variërend van 'vrij van lijden' tot 'kwaliteit van leven' ; 2) de economische en / of emotionele belangen bij een verbod, dan wel bij het toestaan van het gebruik van zeeleeuwen in reizende circussen en 3) hetgeen experts beschouwen als een welzijnsrisico, variërend van gevaren (factoren met de *potentie* om welzijnsproblemen te veroorzaken) tot de prevalentie en impact van klinische bevindingen (de kans op diergerichte indicatoren van onwelzijn, maal de impact van de gevolgen bij blootstelling aan omstandigheden die kenmerkend zijn voor reizende circussen). De laatste benadering heeft een meer kwantitatief karakter.

Kortom, de kwestie betreffende het welzijn van zeeleeuwen in reizende circussen is multidimensionaal en heeft dringend behoefte aan empirisch bewijs ('feiten' ; diergerichte waarnemingen van welzijnsindicatoren) en een grondige evaluatie van de ethische en politieke dimensies van het probleem. Gelet op de geringe aantallen dieren, de vele verstorende invloeden, het mobiele karakter en de geografische spreiding van reizende circussen is het uitvoeren van betrouwbaar diergericht onderzoek aan zeeleeuwen in het circus evenwel een haast onmogelijke opgave.
Te midden van deze verschillende dimensies, de heersende onzekerheid (gebrek aan objectieve informatie) en de meningsverschillen tussen deskundigen die in dit rapport zijn blootgelegd, is het aan beleidsmakers en politici om te besluiten om in Nederland het gebruik van zeeleeuwen in reizende circussen al dan niet te verbieden.

Executive summary

Objective: This limited study was conducted to present an overview of the findings and expert opinions on keeping, training and performance of sea lions in travelling circuses and the consequences for their health and welfare.

Methods: A literature search was supplemented with an expert consultation. In total 20 experts were consulted with either an extended (n=7) or a limited (n=13) questionnaire.

Behaviour in captivity: Sea lions performing in circuses are mostly Patagonian or South American sea lions (*Otaria flavescens,* formerly *Otaria byronia*) and California sea lions (*Zalophus californianus*). No empirical studies have been found providing evidence on the welfare and health status of sea lions in travelling circuses. A few peripheral and case-studies on captive sea lions (zoo, dolphinarium) point to possible welfare problems like eye problems, regurgitating and pattern swimming. A lack of complexity and stimulation, not being sufficiently satiated, a relatively small pool size and overexposure to UV light have been identified as potential hazards to the welfare of captive sea lions. Compared to a zoo environment, a circus environment is likely to address the cognitive abilities of the animals more often, as it may provide more and varied stimuli. On the other hand, pool dimensions in a travelling circus are likely to be smaller. Because of the special circumstances, caution should be exercised, in extrapolating data from zoos and dolphinaria to travelling circuses. According to experts, sea lions in circuses demonstrate a maximum lifespan of 25-30 years.

Species specific behaviour: Sea lions are very adaptive, sensitive, semi-aquatic and opportunistic carnivores that live in complex social and physical environments where they spend ample time on swimming, diving and foraging on prey which is irregularly distributed. Because sea lions cannot sweat or pant, they use their exterior environment for thermoregulation. Depending on food availability sea lions are non migratory and deep diving is largely governed by the water depths available. During foraging trips sea lions spent half of their time at sea and the other half at haul-out areas.
Sea lions have well developed sensory powers that are likely to aid prey detection, particularly in low light conditions. Their eyes are anatomically adapted to the low light conditions in water. Sea lions can detect and differentiate odors. Nose-to-nose contact is important in social communication and recognition. The maximum lifespan recorded in wild sea lions is 16-20 years for males and 25 years for females.

Expert opinions: In total 20 experts provided input on different aspects regarding sea lions in circuses, 7 experts filled in an extended questionnaire that revealed the following description of the current practice of keeping sea lions in travelling circuses. Other experts were asked to give their opinion on the sea lions' in travelling circuses overall welfare state, major welfare risks and recommendations for improvement. The experts' answers illustrate a wide variety of opinions on the question whether or not the welfare of sea lions in travelling circuses is at stake.

Housing: Sea lions in travelling circuses have a pool in a transportation truck, a main swimming pool and a shaded haul-out (resting) area. The water in the indoor pool (in the truck) is regularly replaced and the water is filtered using a sand filter. The animals mostly live in small stable family groups and are fed about 6 kg of good quality fish per day by hand in several portions (e.g. 3-4 times per day).

Transport: Sea lions are normally transported dry (no water in the pool) and lying free in the truck. Sea lions in travelling circuses in the Netherlands are probably mostly transported over short to medium distances (up to several hundred kilometres). Because of the travelling nature of the circuses, sea lions habituate to being transported provided good facilities are available (including good insulation and limited vibration of the vehicle, and a knowledgeable and responsible driver). Travelling circuses usually have a 'winter stop'.

Training, performance and human-animal relationship: Sea lions in travelling circuses are trained using target training, which basically involves positive rewards with food being the primary reinforcer. Starvation is never used, although the maintenance of a training weight is practiced. Circus performance is generally twice a day but in exceptional cases this can be up to four times a day, during 8-10 minutes. Experts stress the importance of flexible shows with variation in frequency / repetition. Circus sea lions are for the most part likely to be valuable for their owners, not only economically, but also emotionally. Within the constraints of the circus, sea lions therefore probably get the best possible care.

Guidelines and transparency: Many countries have legally binding requirements for both zoo and circus animal welfare. These tend to be in the form of licensing which requires periodic inspection by persons who are experienced in matters of animal welfare (generally government appointed). Licensing is only granted when welfare standards have been met. Failure to operate without a license is legally sanctioned by fines or even to animals being removed.
Existing German and British guidelines for the keeping of sea lions in circuses provide a starting point for safeguarding a minimum level of welfare for circus sea lions. Guidelines imply the best possible description of what is regarded as adequate housing and management conditions, needed for safeguarding acceptable welfare standards for sea lions in circuses. This also implies compromises between animal interests and feasible husbandry conditions that cannot always be scientifically substantiated in all detail.

Conclusion:
The experts largely agreed on the major threats (hazards) to the welfare of sea lions in travelling circuses. *Pool dimensions*, *space*, *social conditions*, *food* and *water quality* were mentioned as the top-five potential causes of poor welfare. These factors evidently associate with the relevant characteristics of the sea lions' natural habitat and the restrictions of keeping sea lions in a circus environment.
Despite agreement on major threats, the experts that scored the overall welfare state of sea lions, however, have strongly divergent opinions on the welfare state of sea lions kept in travelling circuses. From the twelve experts that expressed their view on the sea lions' overall welfare state, six experts scored from 5.5 upwards and six experts scored from 5.5 downwards on a ten-point scale.
In scoring the overall welfare state the experts probably used different frames of reference for their judgements. We hypothesize that different positions in at least the following three dimensions may underlie the divers expert opinions: 1) conceptions of acceptable animal welfare ranging from '***free of suffering***' to '***life of quality***'; 2) economic and/or emotional interests in either a ***ban*** or a ***permit*** on the use of sea lions in travelling circuses and 3) what experts considered welfare risks ranging from ***hazards*** (factors with the *potentia*l to cause poor welfare) to prevalence and impact of ***clinical findings*** (a function of the probability of animal-based indicators of animal welfare and the impact of these consequences, following exposure to travelling circus conditions). The latter reflecting a more quantitative approach.

In conclusion, the issue of animal welfare concern is multidimensional and in dire need of empirical evidence ('facts'; animal-based observations of welfare indicators) as well as a thorough appreciation of the ethical and political dimensions of the problem. Given the small numbers of animals, the many non-controllable environmental factors, the mobility and the geographical distribution of travelling circuses with sea lions, conducting reliable animal-oriented research will however remain, an almost impossible task. In the midst of these different dimensions and the current uncertainty (lack of information) and dissent submitted by this report, it is up to policy makers and politicians to decide as to whether or not the use of sea lions in travelling circuses is to be banned in the Netherlands.

1 Introduction: existing legislation and revision initiative

The Ministry of Economic Affairs is preparing a ban on the use of wild animals in circuses, in accordance with the coalition agreement (Dutch Government, 2012). 'Wild' and 'domesticated' however can be seen as extremes of a graded scale. According to Price (1999), animal populations get domesticated over generations when their gene pool is altered by selecting phenotypes that foster adaptation to the captive environment and human intervention. Because of the longevity of captive sea lions it is not likely that generations have changed quickly allowing the gene pool to adapt.

The Association of Dutch Circus Enterprises (VNCO) argues that sea lions in circuses are domesticated as they often have been bred in the circus, are oriented towards people and are easily trainable. Sea lion acts are also very popular with the general public. The VNCO developed specific guidelines for various species including sea lions (http://www.vnco.info/p-httpd/multimedia/RichtlijnenCircusdieren.pdf) that were heavily debated ever since. Sea lions performing in circuses are mostly Patagonian or South American sea lions (Otaria flavescens, formerly Otaria byronia) and California sea lions (Zalophus californianus). However, there are concerns regarding the health and welfare of these animals. Because they are active predators that swim a lot, it is argued that sea lions do not have enough exercise in the circus, which may reduce their welfare and health.

Several countries are preparing a ban on the general use of wild animals in circuses, including the regulation of possible exceptions. For example, Germany formulated guidelines for various species including sea lions (BMELV, 2005). Finland allows sea lion performances in circuses while (nearly) all other wild animals are prohibited. Sweden expressed an intention to ban sea lions in circuses with a reference to the inability to express natural behaviour (Regeringskansliet, 2011). A, working group in Denmark, appointed by the Ministry of Justice, was divided on the issue (Justitsministeriet, 2008). Other countries like the UK and Belgium have been working on or have decided on a general ban on wild animals in circuses. These diverging opinions complicate the decision making by the Dutch Ministry of Economic Affairs. For this reason a limited study was commissioned into the facts and opinions expressed in the literature and by ('hands-on') experts on the welfare and health of sea lions in travelling circuses.

The objective of this research was to provide the Dutch government with arguments concerning welfare aspects of keeping sea lions in travelling circuses. This report focuses on presenting the state of art regarding literature and expert opinions on the welfare of sea lions. It does not include recommendations for political decision making, as this is beyond the scope of this report.

2 Approach

2.1 Literature searches

Literature searches were conducted mainly using Scopus, Web of Science, Google and Google Scholar. A starting point was provided by the general information about the natural history of the species that can be found on Wikipedia and Animal Diversity Web. We searched using keywords like 'sea lions' and 'welfare' or 'behaviour'. We also asked the Ministry of Economic Affairs and the stakeholder WDDTU (Wilde Dieren De Tent Uit, i.e. 'Wild Animals Should Be Banned) to provide relevant reports. These they kindly submitted.
In total we collected the references in Endnote and used the 'find text' procedure in Endnote to collect pdf files of scientific references using the library subscription available to employees of Wageningen UR. Collected reports and publications were scanned for welfare relevant findings.

2.2 Expert consultation

In November 2013 an expert consultation procedure was started by email and phone. The procedure involved asking a selected set of questions to experts, who participated by providing input and comments on each other's suggestions. The procedure was based on earlier work formulating a consensus conceptual framework for welfare assessment and welfare priorities for farm animals Anon., 2001a; 2001b), on systematic literature reviews (Bracke et al., 2006; Spoolder et al., 2011a; Spoolder et al., 2011b) and a recent enquiry into separation ages for primates (Bracke and Hopster, 2013).
Invitation mails were sent to an initial set of 6 experts. These experts were suggested by The Ministry, by the stakeholders (VNCO and WDDTU) and derived from the initial literature searches specifically directed at finding experts specialised in applied animal behaviour and welfare. The contacted experts were then asked to list up to 5 other experts. Expert listing was intended to both identify the main experts and to check whether we had correctly identified the main experts.
Experts were asked to provide their opinion on a) what they considered to be the main welfare issues for sea lions in travelling circuses; b) how good or bad sea lion welfare was in their view and c) what should be the main minimum requirements to maintain good welfare. Correspondence with the experts is presented in Annex 1, including questionnaires and responses received from the experts.
Two questionnaires were constructed: a limited and an extended version. The limited version consisted of the three questions above (welfare priorities, score and requirements).
The extended questionnaire contained the following blocks of questions:

1) *Personal information*
2) *Welfare priorities, safeguards and (other) experts*
3) *Welfare related descriptions (of the animals and their environments)*
4) *Characterise main welfare issues in relation to the various evolutionary and life stages of the animals*
5) *Welfare needs (esp. while kept at the circus)*
6) *(Classes of) animal-based welfare measures that may be indicative of welfare benefits and problems*
7) *Other suggestions*

The written surveys were supplemented with a few (lengthy) phone calls and two field visits (zoo and circus practice) to see animal husbandry and transport facilities.

In total 20 experts provided input. Seven of these filled out a larger part of the extended questionnaire (including one team of 2 experts, Experts E and F, see Annex 1). Thirteen experts contributed in response to the limited version (again including one team of 2 experts, Experts 7 and 8, see Annex 1).

2.3 Background on animal welfare, general considerations and reading guide

Animal welfare

There is no simple, universal definition of animal welfare. We previously explained our view on this subject in the report on the welfare of animals in travelling circuses (Hopster et al., 2009). Briefly, animal welfare is a concept that, similar to health, environment or safety, can be defined at different conceptual levels (Stafleu et al., 1996). The concept did not originate as a scientific concept, but as a reflection of our value system with which we express our concern about the way we treat animals (Duncan and Fraser, 1997). It helps us to organize our thoughts, to define the various aspects and to discuss it. The welfare of the animal, it's perception of the quality of life (Bracke , 1999), is nevertheless central to the concept.

Despite the fact that scientists still dispute how to define animal welfare, they share a general conceptual framework for welfare assessment (Anon., 2001; Welfare Quality®, 2009) and many people seem to have a clear picture of the animals' perception of the quality of life. Several community groups remarkably agree on 'disease' , 'pain' , 'fear', 'frustration' and 'boredom' as important elements of reduced welfare (Duncan, 2002). Although such subjective experiences are not scientifically accessible, indirect animal-based measurements can be used to make reasonable inferences about the animals' feelings. The World Organization for Animal Health (OIE) recently considers the 'biological functioning' as well as 'the mental state' aspects defining animal welfare as "an animal is in a good state of welfare if (as indicated by scientific evidence) it is healthy, comfortable, well nourished, safe, able to express innate behaviour and is not suffering from unpleasant states such as pain, fear and distress" (OIE, 2010).

If we focus on the animals' feelings and also incorporate the dynamics involved in the lives of animals, we may agree on the following definition "Animal welfare is the balance of positive and negative feelings that an animal experiences during its life" (Spruijt et al , 2001). This definition includes the animals' needs for stimulation/variation, challenge and dynamics, inevitably including brief periods of (mild) discomfort, stress and pain. Provided that there are sufficient positive experiences, the resulting overall mental load (which may be called "allostatic load") may still remain within the limits where the animal is able to cope without suffering (Short et al , 2007).

These conceptual definitions closely relate to the question how animals can be treated in an ethically sound and responsible way (Rushen and Passile, 1992). It requires ('clever') scientific measurements (incl. insights, methods, and techniques such as cognitive bias experiments) to examine and interpret perceptions and feelings of animals, that is, their mental state (Mason and Mendl, 1993). Natural or species specific behaviour is widely considered as an important starting point for assessing the potential risks on animal welfare problems in captivity (Anon., 2001). This implies that in addition to the prevention of mental suffering and allostatic load, adequate welfare may also include the opportunity for animals to express relevant aspects of their species specific behaviour. This inclusion of positive aspects of animal welfare broadens the definition of animal welfare, and what is to be included in the animals' 'intrinsic value'.

It is clear that in the public debate on what is (acceptable) animal welfare the questions on what animals need as a minimum requirement (which can vary from e.g. 'free of suffering' to 'having a decent a life of quality') and what we accordingly consider to be ethically acceptable easily converge. Because of this complexity, the Dutch Council of Animal Affairs (RDA, 2010) promotes a dialogue, in which all pertinent aspects and views are to be considered, as a basis for public policy on the use of animals. That also includes other than animal welfare values (economics, ecology, culture, relationship) in using animals, implicitly accepting differentiation in animal welfare regulations related to the variety in animal practices. This implies for example that the cut-off points of what is considered acceptable welfare for wild animals may vary depending on the other values at stake. In a recent study into Dutch citizens' views on human-animal relationship, human interest in using animals for performances was considered as subordinate to the interests of the animals, whereas in pest control the human interest dominated (De Cock Büning et al., 2012).

In line with the gradual shift towards a higher moral status of animals used by humans, the Dutch Animal Law takes natural behaviour (the 'fifth freedom') as a starting point for animal welfare. In the recent decree on animal caretakers (Besluit 'Houders van Dieren) the criteria for assigning exotic mammalian species to a so called 'positive list' for being kept as pets derived from the specific behavioural repertoire of the species (Art. 1.4). According to these criteria, which we used for structuring chapters 3.1, 3.2 and 4.5, we posed the following three questions.

1. What do we know about the biological characteristics of sea lions in their natural habitat?
2. What do we know about the behaviour and health of sea lions in travelling circuses?
3. What are the differences/discrepancies between 1 and 2 , and how can we interpret these in terms of likelihoods and risks for positive (pleasure, satisfaction, reward) and negative (pain, fear, frustration, boredom) experiences/feelings?

In summary, the concept of animal welfare contains both the facts that are indicative of 'suffering' and the ability to perform 'natural behaviour' as well as their interpretation in the light of social values and norms. As far as the opinions of experts are concerned, besides their different interests, we should take into account that experts may also review the same facts from different value systems.

In this study however, we try to avoid the ethical discussion as much as possible and focus on identifying available (and perhaps missing) facts, from both the literature and the circus practice.

General considerations
For the systematic assessment of the welfare of sea lions in travelling circuses the following general considerations were taken into account. Previously, we defined natural behaviour, in the context of animal welfare, technically as follows: Natural behaviour is behaviour that animals tend to perform under natural conditions, because it is pleasurable and promotes biological functioning (Bracke and Hopster, 2006). More specifically, knowledge about natural behaviour can be used to define hazards and likely benefits to the welfare of animals. According to our definition, 'natural behaviour' refers to positive feelings as well as physiological and ethological aspects. Therefore, discrepancies between captivity and natural conditions can be used to list hazards (a situation that poses a level of threat), but these do not necessarily result in a high prevalence or major impact in practice. For this, animal-based indicators of maladaptation and suffering such as reduced longevity, reproductive failure, harmful social behaviour, stereotypic behaviour, health problems and/or evidence of chronic stress must be established in practice as well.

Reading guide
Chapter 3 presents the natural behaviour of the two main species of sea lion kept in travelling circuses: Patagonian or South American sea lions (Otaria flavescens, formerly Otaria byronia) and California sea lions (Zalophus californianus). This is done by simply citing the full articles on these species as published on Animal Diversity Web: Liu (2000) and Price (2002) respectively.
Chapter 4 describes the housing and husbandry conditions of sea lions in travelling circuses, including aspects related to training and transport. Chapter 5 gives the input received from the 3 experts first contacted. Chapter 6 gives a (very) brief overview of the information obtained from the literature about welfare problems in circus sea lions. Finally, Chapter 7 gives a short discussion and draws main conclusions.

3 The natural behaviour of sea lions

According to Kirkwood and Goldsworthy (2013) 'sea lion' is a term used for otariids in the genus *Neophoca, Eumetopias, Zalophus, Otaria* and *Phocarctos*. Sea lions performing in circuses are mostly Patagonian or South American sea lions (*Otaria flavescens*, formerly *Otaria byronia*) and California sea lions (*Zalophus californianus*). The natural behaviour of sea lions is described below.

3.1 Patagonian or South American sea lions *(Otaria flavescens)*

The description of the natural behaviour of the Patagonian sea lion is adapted from (Liu, 2000) and Campagna (2008), unless a specific reference is provided in the text.

3.1.1 Need of physical activity and a specific living environment

Patagonian sea lions are non-migratory animals that reside along shorelines and beaches, usually consisting of sand, gravel, rocks and/or pebbles. They also live on flat rocky shelves or cliffs with tidepools and boulders. The geographic range in which they are observed is on the South American coast (23 degrees south latitude on the Atlantic sea side to 5 degrees south latitude on the Pacific sea side), and in addition they have been observed on the Falkland Islands and the Galapagos Islands. This implies that they live in saltwater environments in temperate climates.

The Patagonian sea lion shows behavioural responses to thermal changes. When the temperature gets too cold, they position their bodies so that minimal surface area is exposed to the air. An individual may lie on its belly and covering its forepaws. When it gets too warm, individuals may lie belly up with one hindfoot stretched. Females tend to choose tidepool areas where the water temperature is not over 30 degrees Celsius. These thermoregulatory factors and topological features affect the breeding behaviour of females and thus indirectly also the features of male territories.

Sea lions forage on benthic (bottom) and demersal (at or near the bottom) prey which is irregularly distributed. Due to the physiological limits of dive depth and duration, benthic foragers are constrained to shallower regions and shelf seas (Kirkwood and Goldsworthy, 2013).

Sea lions sleep while ashore. Sleep is interrupted every 20 minutes to check the environment or perform comfort behaviour. They can also sleep when at sea; one flipper is in motion and the brain side associated with this flipper is active, while the other brain side is asleep. This may continue for hours (Kirkwood and Goldsworthy, 2013).

3.1.2 Size of the adult animal and other physical characteristics

Adult male Patagonian sea lions reach 2.6 metres in length and weigh between 300 and 350 kilograms. Adult females are on average two metres in length and can weigh between 140 and 150 kilograms. The coat of the males is dark brown on the dorsal side and dark yellow to gold on the ventral side. Females have a lighter coat relative to males, ranging from a fair brown to yellow colour with some pale markings around the head. The males become sexually mature at 5-6 years and females become sexually mature at 4 years. Both sexes reach their full adult size around 8 years of age.

At birth pups weigh 11-15 kg and are 75-85 cm long. Young pups are greyish orange on the ventral side and black on the dorsal side. After the first moult at 1-2 months of age they become dark brown.

Sexual dimorphism is shown in pups. Male pups are around 0.87 metres in length and 13.7 kg in weight. Female pups are smaller, being 0.79 cm in length and 12.3 kg in weight.

The livespan of the Patagonian sea lion in the wild is between 16-20 years.

Vibrissae are the stiff hairs associated with the eyebrows, nose and upper lip. The vibrissae associated with the upper lip are heavily innervated, surrounded by blood sinuses and controlled by voluntary muscles. They can sense sound compression waves, movement vibrations and water turbulence, and are likely to aid prey detection, particularly in low light conditions. In addition, they help in navigation as they can detect changes in water current and swim speed. On land they can be used to judge close distances (by sniffing) (Kirkwood and Goldsworthy, 2013).

The auditory system is important for detection of prey and predators and individual recognition. The eyes are anatomically adapted to the low light conditions in water; most notable is the relatively large size of the eyes. The cornea has highly keratinised epithelium for protection against dirt, wind and water. The retina is dominated by rods (enables sensitivity to dim light and nocturnal feeding). Tear ducts irrigate the eye when the animal is out of the water; when the eye is irritated due to dust or bright light tearing can be profound (Kirkwood and Goldsworthy, 2013).

Sea lions can detect and differentiate odours. Nose-to-nose contact is important in social communication and recognition.

3.1.3 Need of periods of (in)activity during the day or seasonally

Using satellite tracking and time-depth recorders, detailed information has been collected for the closely related Australian sea lion (Neophoca cinerea) as described by Kirkwood and Goldsworthy (2013). Australian sea lions travel distances of 118 km (juveniles),190 km (adult female) and 340 km (adult males) from their colony on foraging trips. These trips averaged 1.1 days (max. 5.1 days) in juveniles, 1.2 days (max. 6.2 days) in adult females and 2.5 days (max. 6.7 days) in adult males. During these trips, animals spent half of their time at sea and the other half at haul-out areas.

Patagonian sea lions are diurnal animals and non-migratory animals. There is a mating and breeding season between August and December.

3.1.4 Feeding behaviour and diet composition

Patagonian sea lions are opportunistic carnivores, eating more than 40 species of fish, cephalopods, crustaceans, and other invertebrates, depending on their home range. In addition, they have been observed to hunt and eat penguins. A small percentage of adult males hunt on female South American fur seals and their pups. Patagonian sea lions hunt in groups and are typically found hunting in shallower waters rather close to the shore (up to five miles).

When searching for food, sea lions travel alone or in small to large groups. The mean depth of lactating female foraging dives is about 61 metres and the mean duration just over three minutes. The maximum depth recorded for a dive is 175 m for over 7 minutes. Dive depth and length are unknown for males, but it has been recorded that they spend about 90% of their time in water depths over 50-100 metres. It has been recorded that hunting males covered an average of over 600 kilometers before returning to land.

Dive depth of the Australian sea lions varied between colonies and was largely governed by the water depths available. Average dive durations of adult females were 3.3 minutes (max. 8.3 min) with interdive surface intervals of 1.4 minutes. These animals can undertake 10-11 dives per hour (Kirkwoord and Goldsworthy, 2013).

3.1.5 Reproduction and raising of pups

The Patagonian sea lion is polygynous (a mating pattern in which a male mates with more than one female in a single breeding season). The mating season is from early August to December and the territories for breeding are usually on beaches of sand, pebbles or flat rock. Males defend their territories aggressively and show pre-mating behaviour (mutual vocalisations, snout and mouth contact, smelling, playful biting). Males prevent females from leaving the beaches until they have mated.

The gestation period is about one year. Birth occurs from Mid-December until early February with the peak in Mid-January. The Patagonian sea lion typically gives birth to one pup. After birth, mothers fast for five to seven days in order to nurse their pup. Six days after parturition females enter estrus and mate with the male in whose territory they gave birth. After mating, i.e. 2-3 days after estrus, the mother leaves the pup behind to search for food in the sea for 1-4 days. They return for two days from their feeding trips in intervals to nurse their young. A female is able to locate her pup first calling and then identifying it by smell. External conditions (storm, high tide, male abductions) and being an inexperienced mother may result in mothers being unable to find their pup and in pups dying from starvation. Mothers nurse their pups until weaning at 8-10 months of age, when the mother gives birth to another pup. Sometimes females are observed to continue nursing a yearling when they are nursing a new pup. Pups typically enter the water for the first time at 3-4 weeks of age. They do not go into deep water unless they are accompanied by the mother.

3.1.6 Safety and hiding places

After mothers leave their pup to search for food, the pups are protected from both predators and abduction by hundreds of other sea lions present in the same area (because sea lions mate and breed synchronously). Because of the mass birthing systems sea lion females may be aggressive towards other females when defending the pups. Pup mortality can range from 2 to 50%, depending on the size of the population. Larger populations experience higher pup mortality because of the greater risk of pups being trampled to death by adult sea lions. Pup mortality can be due to predators (such as pumas), diseases, parasites, drowning, (sub-)adult males, and starvation (when they lose their mothers).

During development of the pups, males may abduct the pups. This can occur during the day or night and is related to the number of females being in oestrus, their location and the tide level. Abduction of pups occurs during early oestrus in order to attract the mother away from the territory for mating purposes. These abductions or raids may indicate the strength and power of a resident (territory-holding) male. During these abductions pups may be killed. Mothers try to retreive the pup when it is abducted.

Patagonian sea lions used to be hunted by humans for fur, meat and oil until recently.

Predators of the Patagonian sea lion are pumas, sharks, and killer whales.

3.1.7 Social and biosocial needs

The Patagonian sea lion is a social species living in groups. Groups usually consist of multiple females and one to several males who defend the territory. Males actively patrol their territory, threaten intruders, and advertise their territorial boundaries through vocalizations. However, fights between the male and any intruder are rare unless the intruder tries to take over the territory.

Fights are most prominent between two bulls during the initial phase of the breeding season. The number of fights between males increases as the number of females in heat increases. Males emit vocal grunts and attack each other by biting and tearing. During these fights, many pups may be stepped upon and killed. Males may maintain their territories up to 2 to 3 mating seasons before another male takes over. A male's territory is highly dependent on the presence of females rather than topological features or size. Each bull typically has 18 cows in his territory. Young males who have not yet been able to obtain females usually live with other young males in groups of 10 to 40 individuals. Males in these groups attempt to take over established male territories in order to obtain females.

Sea lions give birth simultaneously which promotes social bonding between pups. Pups spend most of their time in groups where they play, sleep and reside near the water. They enter the water in a large group.

3.1.8 Need for stimuli and enrichment

Sea lions are considered intelligent and playful animals that learn quickly from their experiences (Kirkwood and Goldsworthy, 2013). Patagonian sea lions are a group living species, but when hunting for food they may travel alone or in small groups. The social structure is described under 3.1.7. Their living environment is complex and consists of beaches, flat rocky shelves or cliffs with tidepools and boulders and shallow water up to five miles from shore. They may travel long distances when hunting for food.

3.1.9 Other aspects

Although their population is not currently threatened, they are protected throughout most of their range. The International Union for the Conservation of Nature (IUCN) rates the Patagonian sea lion at 'lower risk', and they have no special status on the US Federal List or the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

3.2 California sea lions *(Zalophus californianus)*

The description of the natural behaviour of the California sea lion is adapted from Price (2002) and Aurioles and Trillmich (2008), unless a specific reference is provided in the text. Some general characteristics of sea lions are described above for the Patagonian sea lion (e.g. sleep and sensory systems) and are also valid for California sea lions, but not repeated in this paragraph.

3.2.1 Need of physical activity and a specific living environment

California sea lions are found along the shore from California to Mexico including Baja and Tres Marias Islands, in the Galapagos Islands and in the southern Sea of Japan. They live along coastlines but also have been observed in rivers along the northern Pacific coast. California sea lions often congregate on man-made structures (piers, oil platforms etc); they tend to inhabit places which have undergone human intervention.

The California sea lion population is abundant and increasing in some regions; the estimated global population is around 355,000 individuals. Some colonies in the Gulf of Californa have decreased in the last two decades.

The normal body temperature of *Zalophus californianus* is 37.5 degrees Celsius. Because California sea lions cannot sweat or pant, they must alter their exterior environment in order to thermoregulate. For example, if the air temperature increases they seek cooler areas, such as water.

3.2.2 Size of the adult animal and other physical characteristics

The California sea lion is a sexually dimorphic species. Adult males average 2.2 meters in length and 275 kg in weight but can reach a length of 2.4 meters and a weight of 390 kg. Females reach only 2 meters in length and weigh an average of 110 kg. Newborn pups are around 75-80 cm long and weigh 5-9 kg.

Pups have a blackish brown coat, which is molted by the first month and replaced with a light brown coat. The light brown coat is replaced with the adult pelage after 4 or 5 months. Adult males are mostly dark brown with lighter belly and side coloring. Adult females are dark brown but can also appear tan. In addition to the head features males are more robust and larger than females.

Age of maturity for both sexes is about 4-5 years.

The maximum lifespan recorded in wild California sea lions is 17-19 years for males and 25 years for females. They get older in captivity, where the maximum lifespan recorded is 31 years old.

3.2.3 Need of periods of (in)activity during the day or seasonally

California sea lions tend to seasonally migrate over long distances. Large numbers of adult and sub adult males and juveniles undertake a post-breeding season migration north from the major rookeries to southern California and Baja California and in winter from central California to Washington State. Smaller numbers of animals migrate to British Columbia and southeast Alaska. Others appear to remain in the Gulf of California year round and do not undertake long migrations.

3.2.4 Feeding behaviour and diet composition

Feeding bouts occur during the day and the night with peaks of activity at dawn and dusk.

The diving pattern of the California sea lion is consistent with that of a number of other otariid species. The deepest dive recorded was 274 meters with a duration of almost ten minutes. Typical feeding dives are shallower than 80 meters and last less than three minutes. Swimming speeds reach 15 to 20 miles per hour. Feeding dives occur in bouts, suggesting that California sea lions exploit patches of prey.

Male California sea lions have been known to assemble at the mouths of fresh water rivers where there is a steady supply of fish. California sea lions feed on a wide variety of prey, but usually maintain a preference for 4-5 species at each location, often taking what is abundant locally or seasonally in the areas they occupy. A higher diversity of prey is taken outside the breeding season, when many animals disperse over large areas, as opposed to during the breeding season, when preferred prey can be reduced by intense foraging activity in small areas within the travelling range of the rookeries.
Principle prey includes: Pacific whiting, market squid, red octopus, jack and pacific mackerel, blacksmith, juveniles of various species of rockfish, herring, northern anchovy, and salmon, which differs between the areas where they live.

California sea lions tend to feed alone or in small groups unless there is a large quantity of food available. Under conditions of increased food supply, California sea lions hunt in larger groups. California sea lions have been known to feed cooperatively with cetaceans, seabirds and harbor porpoises. Often one species locates a school of fish and signals the presence of food to the other species. While rare, it has been recorded that California sea lions drink seawater while not breeding.

Prey availability is greatly reduced during El Niño events and large numbers of pups die of starvation in these periods.

3.2.5 Reproduction and raising of pups

California sea lions tend to breed on islands or remote beaches. Females produce one pup per year after a gestation period of 11 months. Pupping and breeding take place from May through July with the peak breeding season early July and most pups born mid June. The time between birth and estrus is about 28 days. Pupping starts about two weeks earlier in the Gulf of California than in California and the duration of the breeding season is longer in the Gulf (13 weeks) than in California (9.5 weeks). Males are polygynous and claim territories both on land and in shallow water near the shore for periods of usually two weeks but up to 45 days. While guarding their territories the males do not leave the territory. When external factors change, males replace other males on the territory which occurs throughout the whole breeding season. Males attack others that invade their territory.

Females stay ashore with their newborn pups for about seven days before they depart for the first time for a foraging trip that usually lasts 2-3 days. Foraging trips are followed by attendance with the pup at the rookery for 1-2 days, after which females leave again for foraging. Most pups are weaned at 12 months of age, although some pups receive maternal care as yearling and 2-3 year old. Maternal care for female offspring is longer as compared to male offspring. Other reasons for variation in lactation periods include availability of food resources, age and health of the mother and the birth of a new pup. They sometimes adopt a foster pup that has been abandoned by another female.

3.2.6 Safety and hiding places

California sea lions were hunted for a variety of products (hides) and to reduce their impact on fisheries. They can also be killed because of getting entangled in discarded fishing gear.

Predators include killer whales, sharks, coyotes and feral dogs.

3.2.7 Social and biosocial needs

The California sea lion exhibits moderate to extreme polygyny and tends to live in colonies of a few males and many females.

3.2.8 Need for stimuli and enrichment

The California sea lion is a group living species although they tend to feed alone or in small groups. Pups show many different play behaviours including play fighting. The complex natural environment of the California sea lions consists of shores and rivers. They are generally found in waters over the continental shelf and slope zones, but also occupy islands in deep oceanic areas. Like the Patagonian sea lion they may travel long distances to hunt for food. California sea lions are very agile and trainable.

3.2.9 Other aspects

California sea lions are well protected in most areas. Because they are highly trainable, they are often used as performing animals in zoos, circuses and aquariums.

Due to the large and increasing population size, the California sea lion is classified as ‘least concern’ on the IUCN Red List and has no special status on the US Federal List and CITES.

Exploitation during the 19th and 20th centuries caused population reductions, but the distribution range did not change. Population numbers increased mainly in California.

3.3 Conclusion

Sea lions are very adaptive, sensitive, semi-aquatic and opportunistic carnivores that live in complex social and physical environments where they spend ample time on swimming, diving and foraging on prey which is irregularly distributed. Because sea lions cannot sweat or pant, they use their exterior environment for thermoregulation. Depending on food availability sea lions are non-migratory and deep diving is largely governed by the water depths available. During foraging trips sea lions spend half of their time at sea and the other half at haul-out areas.
Sea lions have well developed sensory powers that are likely to aid prey detection, particularly in low light conditions. Their eyes are anatomically adapted to the low light conditions in water. Sea lions can detect and differentiate odors. Nose-to-nose contact is important in social communication and recognition. The maximum lifespan recorded in wild sea lions is 16-20 years for males and 25 years for females.

4 Expert opinions on sea lions in captivity

This chapter summarises the experts' opinions received from experts A-G who filled in the extended questionnaire. The experts consulted were either employed in a circus (n=1), zoo or dolphinarium (n=3) as trainer or veterinarian or were working as independent consultant or trainer (n=3). They are all specialised in sea lions and some of them have a broader knowledge of marine mammals in general (see Appendix 1). The questionnaire to the experts is shown in Appendix 2.

4.1 Housing and management

The extended questionnaire contained various questions on housing and management. These questions are relevant for assessing sea-lion welfare because they describe the physical environment in which the animals live and indicate the associated constraints.

In short, sea lions in travelling circuses have a pool in a transportation truck, a main swimming pool and a shaded haul-out (resting) area. The water in the indoor pool (in the truck) is regularly replaced and the water is filtered using a sand filter (see Figure 1).

The animals mostly live in small (n < 5) stable family groups and are fed about 6 kg of good quality fish per day by hand in several portions (e.g. 3-4 times).



Figure 1 *Typical sea lions facilities (pool size: about 50.000 liters; 1.2 m deep) (reprinted with permission)*

A survey in 2005 reported about one thousand circuses in the European Union (Galhardo, 2005) (Eurogroup, 2010). About 20 performers/groups with sea lions are working in Europe (Exp. C). The sea lions used, are almost exclusively Patagonian sea lions (Exp. C). Most performers have facilities more or less equivalent to the ones shown in Figure 1 (Exp. C). Relatively few circuses have sea lion shows in the Netherlands. Travelling circuses usually have a 'winter stop'.

4.2 Transport

Transport is relevant for sea lion welfare because transport can be related to the animals' need for safety and the need to be free from pain and motion sickness. Scientific observations on this subject are lacking, and we did not find evidence of presence or absence of welfare problems.
Sea lions in travelling circuses in the Netherlands are probably mostly transported over distances up to several hundred kilometres. Transport durations differ due to the season. For example, a trainer may travel from circus to circus in France, with relatively short distances between locations, then move 400-500 km North to perform in a winter circus in the Netherlands on the way to a Scandinavian country where the winter quarters are located. For Europe, Iossa et al. (2009) estimated an average of 1.9 (± 0.6) resting days between sites, 8.5 (± 1.5) days spent on one location and 167.4 (± 57.1) km as the mean distance travelled (in circuses generally; not specific for sea lions) in the period between February and December 2007

Sea lions are transported in a trailer. The animals are not crated or otherwise 'fixated' (Exp.C).
Sea lions are normally transported dry (no water in the pool) and lying free in the truck. It is also possible to provide water in the pool during transport, to use video monitoring and to have a remote control thermostat to control the environmental temperature inside the truck (Exp.C; pers. obs.). In contrast to the transport of unhandled naïve farm animals Kiley-Worthington (1990) argues that circus animals in general become very familiar with being transported and therefore do not find it a stressful experience. Iossa et al. (2009) however, questioned this, regarding confinement in beast wagons for long time periods as a definite welfare concern, despite the lack of conclusive evidence as to whether animals habituate to travel. Sea lions appear to be calm during transport (Exp. C). Expert C installed video surveillance to monitor how well a young pup would be able to cope with transport. In his view the pup showed no problems. Also, expert C stated he has not seen his sea lions vomit or otherwise show signs of motion sickness. At a Zoo, sea lions are fasted for one day before and during transport to prevent problems with vomiting and diarrhoea (Exp. B).

No relevant statements were collected in our literature survey concerning (long-distance) transport for sea lions.

4.3 Training, performance and human-animal relationship

These aspects are relevant for all welfare needs of sea lions, but especially in relation to the animals' need for exploration and stimulation (positive welfare). In short, sea lions in travelling circuses are trained using target training (operant conditioning, positive reinforcement), which basically involves positive rewards with food being the primary reinforcer (Exp. B,C,D,G) (Maple and Perdue, 2013). Starvation is never used, although the maintenance of a training weight is practiced (Exp. D, G). Circus performance is generally twice a day but in exceptional cases this can be up to four times a day, during 8-10 minutes (Exp. C,D). Experts stress the importance of flexible shows with variation in frequency / repetition to ensure a challenging performance thus avoiding the formation of routines .

Nearly all sea lions in European circuses are Patagonian sea lions. Compared to California sea lions, Patagonian sea lions are considered less graceful, more calm and spooked less easily by e.g. noise (Exp. C). Both species of sea lions are said to be highly adaptable (Exp. A,D,E&F,G) although sea lions may also be regarded as prone to stereotypic behaviour when their basic needs are not met (Exp. G), including a high degree of vigilance and/or lethargy. Experts considered sea lions' coping abilities to depend on their habituation to the captive environment from an early age (as in the case of sea lions in circuses, some sea lions currently performing in Europe were born and raised in the circus, Exp. D) and on the intensity and methods of training (E&F). All experts agree that sea lions are very 'intelligent' and trainable i.e. they have very good memories and perception powers, and are capable of learning problem solving tasks (e.g. lift an object to find fish etc.). Sea lions are playful, curious (Exp. C), fast and flexible and capable of learning abstract concepts, language and a wide variety of tasks (Exp. G).

According to most experts, sea lion behaviour strongly suggests that they are happy to be trained and like to perform. They express anticipation to performances by looking for the trainer, by waiting at the gate of their accommodation, by willingly entering performance areas and taking their positions (station), by pre-empting clues for behaviours (Exp. D), by walking back and forth, swaying, stretching out to see where the trainers are, and other expressions of eagerness to participate (Exp. G). Once aware of an upcoming performance, the prevention of animals from acting elicits frustration behaviour (Exp. E&F). Sea lions generally enjoy human contact and the stimulation of training (Exp. C). They also) like food, petting and hugs (Exp. B). They often enjoy presentations as it adds value to their day, keeps them busy and access to fish so they might therefore want/need to participate (Exp. G).

Sea lions dislike monotony, bad fish quality, incompatible social groups and being locked away in isolation, unless the alternative is to be housed in an incompatible social group (Exp. G). Sea lions dislike it if they are permanently withheld the opportunity to swim (Exp. E&F).

Keeping sea lions is likely to be expensive in terms of facilities (pool, filter, transport) and food (about 6 kg of good quality fish per animal per day). Besides being economically responsible for their animals, circus trainers literally live with (or are in close proximity to) their animals 24 hours a day. In a circus, trainers and keepers consider this a lifestyle of which the animals are an integral part (Exp. D). Animals and humans are seemingly part of a social group. There is a lot of trust between sea lions and their trainers (Exp. E&F). Trainers and sea lions have a relationship, based on training and acceptance of the trainer in the environment (Exp. B). It is therefore highly likely that circus sea lions, besides being economically very valuable for their owners, also have emotional value for them. Within the constraints of the circus, sea lions probably get therefore the best possible care.

4.4 Guidelines and transparency

The long questionnaire contained the following questions on guidelines and transparency:
Do the housing conditions meet existing guidelines? Which ones? What do the guidelines prescribe? Which guidelines exist and how are they enforced? How transparent are various welfare requirements? How can they be guaranteed?

Attempts to make European guidelines for circuses have failed so far (Exp. C). Since about 10 years France decided to issue two separate permits. This entails asking questions to a panel of experts on the subjects of trainer quality and facilities. Since that time the conditions have improved considerably, despite the fact that these national permits are not always enforced locally (Exp. C). More recently, various countries have been setting their own regulations.

According to the guidelines (still under construction) of the European Association of Zoos and Aquaria (EAZA) and the European Association for Aquatic Mammals (EAAM), pools for sea lions should be as deep as the size of the largest animal, which for adult sea lions may be as much as 2 or 3 m (Expert B). In addition, animals should have the ability to visually isolate/separate themselves from conspecifics, as it may happen that some individuals have difficulties getting along, e.g. sometimes a male may dislike a particular female (Exp. B). It is recommended that the land surface area should be 45 m2 for a group of up to 6 animals. The accompanying pool surface should be 190 m2.

Committees drafting guidelines often struggle with the scientific basis of detailed rules as is illustrated by the discussion on the required pool depth in the Danish committee (Justitsministeriet, 2008). Some committee members stated that the pools should be at least 2 m deep. No further argumentation was given in the report as to why this would be beneficial for sea lion welfare. Observations from deep pools could resolve this, but the committee is discussing 1.2 m vs 2 m, not 2 m versus 20 m. In Germany, sea lions in circuses must be kept according to the guidelines of the Federal Ministry of Food and Agriculture (BMELV, 2005). These guidelines consist of specific requirements regarding housing facilities (pool size, resting area, water quality), feeding, health care and training and employment. During transport, for example, a swimming pool of at least 4.0 x 2.2 x 1.0 m (8.8 m^3) is required for

up to 2 animals. For each additional animal at least 2 cubic meters of water is required. Each animal must also have a dry area of 2 m2. At the performance site an additional bathing pool is required with a depth of at least 1.2 m and an area of at least 50m2 for up to 4 animals and an extra area of 5m2 for each additional animal. The swimming pool must be rectangular with a much longer pace, connected to large lying surfaces (at least 2 m² per animal).

A circus is a transparent enterprise by nature where animals live in a glass house. Space for swimming, resting and locomotion can easily be checked (Exp. A, G). The same holds for water and food quality, although this can vary over time. Animal-based indicators however, like health problems and behavioural expressions of hunger, boredom or anxiety, are difficult to assess reliably and carefully during inspections. On the other hand, welfare parameters (food, attention, training method, veterinary care) will most probably be OK, as these animals are very valuable to the trainers, and the trainers will have a strong bond with their animals. (Exp. A). This is illustrated for instance by the use of observation camera's during transport to check if animals are not disturbed or stressed during travel (Exp. C).

Many countries have legally binding requirements for both zoo and circus animal welfare. These tend to be in the form of licensing which requires periodic inspection by persons who are experienced in matters of animal welfare (generally government appointed). Licensing is only granted when welfare standards have been met. Failure to operate without a license is legally sanctioned by fines or even to animals being removed. (Exp. D)

In a circus environment, animal trainers are generally not educated to degree level. Many skills such as animal husbandry and training are handed down from family members to other family members - similar, in some ways to an apprenticeship (Exp. D). Sea-lion trainers in circuses often have close contact with trainers/handlers in other areas; zoos, dolphinaria and seal rescue centres such as those on the Dutch coast. This often results in ideas and methods being exchanged as well as experiences gained (Exp. C). An understanding of basic training principles, body language and modern training methods is regarded essential. This understanding can be obtained by experience in practice with or without formal education (Exp. B, D, E&F).

4.5 Behaviour of sea lions in circuses

This paragraph describes the behaviour of sea lions in circuses. Because empirical studies on the behaviour of sea lions in circuses are absent and ‘hands-on’ experts working with sea lions in circuses are scarce, expert opinions on the behaviour of sea lions are partly inferred from experiences with these animals in zoos and dolphinaria.

4.5.1 Need of physical activity and a specific living environment

All experts indicated that the two types of sea lions in European circuses (Patagonian and California sea lion) are fairly to extremely adaptable and may cope with different situations. Training methods may positively affect their adaptability to the conditions in captivity. If their behavioural needs are not met they are prone to develop stereotypic behaviour, lethargy and/or a high degree of vigilance (Exp. G). According to Exp. C, California sea lions are less calm than Patagonian sea lions.

Water to swim is an basic need for a sea lion (Exp. A, B). This not necessarily needs to be salt water, although one expert indicated that salt water should be better for eye health; periodic exposure to salt water is preferred (Exp. D). Exp. A indicated that the lack of a proper saltwater pool is one of the most important differences relevant to animal welfare between sea lions in circuses compared with sea lions in the wild or a zoo. The use of chlorine in the outside pool is minimised and it is not present in the inside pool because chlorine may cause eye problems (Exp. C). Pools need to be drained, cleaned and refilled to retain water quality or water treatment technology should be used. Good water quality is

essential to prevent diseases (Exp. D). If close to the shore, sea water is sometimes used in the outside pool (Exp. C).
Sea lions show sunbathing behaviour (Exp. C). Sea lions also need to cool down and play in the water during hot weather (Exp. D, E, F). In cold weather the time in the water is increased compared to warm or hot weather because swimming raises the body temperature (Exp. C). Good water quality is essential for body care, as are good quality flooring and hygiene. There are no periodic moults with a notable impact on welfare (Exp. D).

Sea lions need to have a choice between resting areas and swimming water. In captive conditions a dry as well as a wet (swimming) accommodation is essential. Sea lions can be transported dry, as long as the thermal conditions in the truck are adequate and the duration of the transport is relatively short. Exp. D indicated that the swimming area is more important than swimming depth. Exp. B indicated that circus pools provide inadequate depth (depth should be at least two times the size of the animal but is less than 2 m in circuses). Exp. C indicated that deep pools are a risk when the lions have to jump out of the pool (risk of injury) and indicates that pools should be less deep (currently 1.2 m deep). Pool size should be such that positive behaviour and interaction between animals is possible. According to one expert (Exp. C) there is one main pool of 50.000 litre, a 15.000 litre pool in the trailer which is filled after transport and a nursery pool of 20.000 litres for pups; indicated pool sizes are 10.25 x 5.1 x 1.2 m (l x w x h), 5.5 x 2.5 x 1.3 m (indoor) and 6.5 x 3.2 x 1.0 m. Conditions are equal during the winter stop as compared to the circus season, some use large barns in which various pools are placed during winter (Exp. C, D). Exp. A indicated that during the winter stop a large salt water pool is needed but it is not clear if this is indeed provided. Mothers with pups usually are housed separately from the males (Exp. C and D). The pool should not be too deep for pups as there is a risk for drowning II (Exp. D).

Sufficient swimming and stimulation of ‘hunting’ is indicated to be essential to prevent boredom and development of stereotypic behaviour (Exp. B, C). Exp. B indicated that captive sea lions do not have the opportunities to be physically active (swim) as in nature.

Under natural conditions they rest on rocks or pebbled beaches, thus according to the experts the underground can be rough and wet (Exp, A, E, F). It is indicated that sea lions like wooden boarding to rest on and sand can be used as well (Exp. D, E, F). Sea lions normally rest outside the water (Exp. C). Although sea lions are social animals, enough space should be provided to move out of sight (Exp. G). Expert C indicated that PVC mats are laid from the pool to the circus to protect the sea lions from objects on the floor.

Large (custom built) trucks are used for transport. According to Exp. C, the truck includes a 5 m long pool for longer journeys, a separate dry area (8 x 2.5. m) and a filter system for use with the outside pool. The trailer is well ventilated and constructed on an air-suspended truck and contains on-board surveillance cameras. During transport cooling is very important as sea lions are sensitive to temperature stress (Exp. A., D). Exp. D indicated that journey times are usually short (maximum of three hours), except for the start and end of the season when they have to travel to and from their location of the winter stop. Although trucks have a dry and wet area, during transport the pool is usually not filled with water (Exp. D). It is stated that sea lions can spend some time outside the water without any problems. One expert indicates that transport is done in the early morning when the animals are sleeping (Exp. C).

Overheating may be an issue in summer (in case of a lack of water) (Exp. A-G). Shade should be provided or the environment should be cooled (Exp. D, G); one expert indicates that they use a tent to provide shade under extremely high temperatures (Exp. C). One expert indicated that well fed sea lions with good body condition are not affected by cold weather (Exp. D) but others indicate that sea lions should be protected from extreme cold. Exp. C provides heating (infrared heating lamps) in winter. Exp. C rents an indoor hall at temperatures less than -10°C. As blood circulation increases by swimming which raises the body temperature, a heat pump to prevent the outside pool from freezing at night is provided.

Exp. G indicated that the lack of space in circuses is an important disadvantage with respect to animal welfare of sea lions in circuses. Space is also needed to take distance from companions e.g. in case of aggression (Exp. E, F).

Exp. A indicates the use of electric wire to keep sea lions in a certain area. It is explained that sea lions learn quickly and will only get a shock once.

4.5.2 Size of the adult animal and other physical characteristics

Sea lions in circuses currently predominantly originate from captive breeding (Exp. C). Most experts indicated that sea lions are wild animals, although they are easy to train and may be tame to handlers and others. They have never been domesticated. Exp. B, D indicated that sea lions can be dangerous to unfamiliar people approaching them as they may bite. Exp. C indicated that no people have been bitten in the past 25 years. Although Exp. C indicated that there is no inbreeding, Exp. G says that inbreeding might be possible.

Exp. B indicated that handstand, walking on hind flippers and sitting on chairs on hind flippers may result in very warm lower backs, suggesting that the sea lion is not suitable for such ‘tricks’. Occasional bite wounds occur as part of social behaviour, which appear part of natural social behaviour (Exp. C, E, F). Over-exercising, over demanding training or performance, or physical punishment involve a risk for injuries (Exp. G).

Eyes are sensitive especially in older animals (Exp. E, F) and water quality and UV exposure may cause eye problems (Exp. D, E, F). This also appears to be a potential problem in zoos, marinelands and even in the wild (Exp. B). Eye problems in sea lions have a multifactorial aetiology (Exp. E&F, G), often related to water quality (freshwater, chlorine) and overexposure to UV light (Exp. D).

Most experts (A, C, D, F) indicated that sea lions can perform until they die. Captive sea lions reach approximately the same to higher ages compared to wild sea lions (Exp. D). Ages of up to 25 years and older were reported. Only Exp. B indicated that sea lions may perform less or are less interested or more tired at an older age. Exp. D indicated that there might be physical inability to perform at an older age such as impaired vision. This is also common in old wild sea lions.

4.5.3 Need of periods of (in)activity during the day or seasonally

There is a yearly period of pupping and mating. California sea lions will breed in June and July and mate between July and August. Patagonian sea lions usually breed during winter but there is evidence that this moves to summer when they are housed in the Northern hemisphere. During the breeding season adult males are more aggressive (to humans and conspecifics) and may refuse to perform or perform worse (Exp. A-C). According to Exp. C there is no pressure to improve performance in such cases.

Migration is not indicated as being a need for sea lions by any of the experts.

Sea lions rest during the night (according to one expert from 22.00 – 10.00 h) and take naps during the day (Exp. C). In captive conditions they spend their daylight hours outside under natural light conditions (Exp. D).

Experts indicated that sea lions are usually trained all year round, thus also during the winter stop. Daily activities vary from training to performance and local movements (Exp. C). Training is progressive and needs to be continued during the year (Exp. D). Exp. G indicated that each trained sea lion performs a specific behaviour during a show, which involves continuous performance of the animals. Performance schedule varies from one to five performances a day. Experts E, F indicated that training should be constant to provide challenges, enrichment and mental stimulation. The training schedule is similar in circuses compared to zoos and dolphinaria although it is shorter in duration in

circuses (Exp. D). Exp. E and F indicated that taking sea lions off their daily training schedule will lead to reduced welfare.

4.5.4 Feeding behaviour and diet composition

Sea lions in captivity are fed with fish (thawed frozen fish such as Herring, Capelin, Mackerel and Sprats) and feed supplements are used as well (e.g. Vitamin B supplement) (Exp. D). Exp. G indicated that the fish should be cool air thawed and not water thawed when fed. Males eat 10 kg of fish and females 6 kg with highest food consumption in winter. Animals tend to be fed individually (Exp. D); adult males may snap food from young males as expression of the dominance status (Exp. C). One expert indicated that a single species diet may cause problems (Exp. G). Food is necessary for water intake; sea lions get all their water from the fish. No additional water is necessary but in stress situations sea lions may want to drink (Exp. B). Food is used during training and performance (according to one Exp. D 50% is provided during training and performance) as positive reinforcement. The amount of food provided during training is variable and food deprivation is never practiced according to Exp. A, B, C, F, G. The residual food is often provided after the training (Exp. D).

As sea lions are 'hunters', training and participation in performance accommodates this behaviour according to the experts (Exp. A-D).

4.5.5 Reproduction and raising of pups

Sea lions can reproduce in circuses (and zoos and dolphinaria). Birth control is often applied (surgically or hormones in zoos) (Exp. A, E, F). Male sea lions are territorial and can show aggressive behaviour towards females and pups during the breeding season (which may lead to death of pups) (Exp. A, C, D, G). In this case females and pups are separated from the males in the initial period after birth. Male sea lions do usually not perform and cannot be trained during this period (Exp, B, C).

Mothers are housed with their pups during the majority of time (Exp. A); they can be separated for short performance after the pup is one month of age (Exp. C), but it is also indicated that siblings accompany the mother during training and performance (Exp. E, F). Mothers and siblings usually stay together for one to two years in zoos (Exp. E, F) In captive conditions, it is important that mother-pup bonding can occur and that mothers can take care of the pups (Exp. E, F).

4.5.6 Safety and hiding places

Sea lions seem to be sensitive to noise and other stimuli (Exp. A, C) and changes in the environment (Exp. C, E, F). Gradual habituation to noise and light stimuli is necessary. Stressful conditions can be recognised by aversive/ of anxious behaviour of the sea lions. Sea lions should have the opportunity to hide or move away from conspecifics. When males show territorial behaviour females and pups are separated from the males during a short period of time (Exp. D).

Exp. C reports that in case of stress, indicated by the behaviour of the sea lions (scanning the environment with a stretched neck and ignoring the trainer), the sea lion is able to return back to the pool. The passage back to the pool should therefore be easy to find and close by.

Transport is a possible stressor that needs proper attention. The animals are habituated to transport (Exp. C). Exp. C indicated that transport usually occurs in the early morning when the sea lions are sleeping. Proper acclimatisation is needed when the animals are placed in a new social group during transport (Exp. E, F). Ideally, transport should be monitored. In addition, to reduce stress during medical treatment training is used to habituate the animals to these procedures (Exp A). In principle, sea lions being ill should not be transported (Exp, E, F). It is indicated that highly pregnant females (from 3-4 weeks before parturition) are unfit for travel and are not transported (Exp. A, E, F).

4.5.7 Social and biosocial needs

Sea lions are a social species and they need to live in groups of at least two animals (Exp. A, E, F). The composition of the group is important to prevent social stress (Exp. G). In captive conditions group composition can be flexible. One expert indicated that one mature male with different females coexist well (Exp. D). More than one mature male with mature females during the breeding season may give problems due to aggression. Also single sex groups should work well, according to one of the experts, although two males should not be kept together unless they are castrated (Exp. A). Separation may be practiced during the mating period. After retirement sea lions usually stay in the group (Exp. C).

Mothers with pups are separated from the group during a short period after parturition (Exp. C, D). As females show oestrus around ten days after parturition, they will be housed with a mature male around that time if reproduction is allowed. Exp. D indicated that the behaviour of the male should be observed as he might direct his attention to the female even after successful mating, and in that case separation of the male and female may be necessary.

Pups are reported to stay with the mother as long as they suckle (Exp. A), after weaning at about 1 yr of age (Exp. C) mother and pup can be separated (Exp. A). Weaning starts by natural rejection by the mother and by introduction of small pieces of fish, progressing to small fish (Exp. C).

Social needs are considered very important for the welfare of sea lions (Exp. C, E, F); a proper social context in which there is opportunity for affiliative behaviour and good social relationship is important for welfare (Exp. E, F). Social conflict might occur which causes stress and this requires careful and appropriate management of the animals/trainer (Exp. E, F). Less opportunities to avoid/reduce negative social interactions is claimed to be an important difference between captive and natural conditions (Exp. A).

4.5.8 Need for stimuli and enrichment

Sea lions show play behaviour. Although Exp. A indicated that they do not play with toys as long as the pool is big enough and the sea lions are trained. Exp. C, D, E, F indicated that toys (balls, hoops, non-destructible objects) might be useful enrichments if the environment provides few (social) stimuli. Sea lions often play with other animals, showing play fighting and chasing (Exp. C, E, F).

All experts indicated that sea lions are intelligent and trainable. Key words used by experts are ‘playful’, ‘curious’, ‘flexible’, ‘problem solving’. Some experts report anticipation behaviour towards training and performing. The relationship with the trainer can be characterised as ‘strong’ and is considered important as enrichment (Exp. B-E). Experts indicated that the behaviours the sea lions display are variants of their natural behaviour. Exp. C indicated that his sea lions are allowed to sometimes swim in the open sea.

Target training and positive reinforcement (using food rewards) are used as training methods (Exp. B, C, D, G). Punishment leads to contra productive results and is not used (Exp. D). Training of new behaviours tends to be undertaken in small time periods. It is indicated that it is important to establish small increments of progress when training complicated routines and behaviours (Exp. D). Inadequately trained sea lions show behavioural signs of stress (Exp. G).

Training can be started from weaning onwards (with the shift from mother milk to solid food) (Exp. A, D). Exp. B indicated that performance starts from 2-3 years of age. In addition, the complexity of the behaviours that are trained determines the time needed before the sea lions can start to perform. In young animals a number of basic husbandry behaviours (e.g. for medical treatment) are trained (Exp. D). In addition, the first two years are spent socialising. Exp. B, D indicate that training should not exceed the animal’s capacity and that well educated trainers know when the animals are asked to perform behaviours beyond their skills. Behaviours indicating that sea lions cannot cope with the training are head shaking, waving and anxiousness (Exp. E, F, G). There is an accepted variability in

the quality of the performance, especially during the mating season when sea lions may perform less good (Exp.C). If an animal is really unable to perform well enough it is indicated that such an animal will will retire but stays within the circus environment (Exp. C).

Frequency of performance varies between 1-5 shows of a short duration (8-10 minutes with a maximum of 30 minutes per show) (Exp. A, C, D, F). Monotony is unlikely due to the limited length of the show and variation in content of a show (Exp. A, D).

Expert C indicated that stereotypies will not be observed if there is a sufficiently varied daily routine, sufficiently varied training and sufficient socialisation between each other and with the trainer. In absence of these conditions stereotypic behaviour such as stereotypic swimming, head shaking, weaving, regurgitation and flipper aiding in regurgitation may develop (Exp. E, F, G). Stereotypic swimming is difficult to discriminate from normal behaviour (Exp. B). Also increased aggression is reported (Exp. G).

4.5.9 Other aspects

With respect to the education of the trainers, all experts indicated that they should have a basic level of education in animal care and further education with respect to keeping of sea mammals. In addition, several experts indicated that education in positive reinforcement training is essential and that they should be aware of the specific (training) needs of the species (Exp. E-G). In a circus environment many skills are handed down from family members to other family members (Exp. D). Sea lion trainers in circuses are also in contact with trainers or handlers in zoos, dolphinarium and rescue centres which may result in exchange in methods and experiences (Exp.C).

Experts indicated that the welfare of sea lions in circuses as compared with other animals in circuses is difficult to estimate. Exp. A indicated that water availability and quality and good quality food are important issues that need extra attention. Others indicated that there are less issues with keeping and training sea lions compared with other animal species in circuses, or that sea lions receive care comparable to other animals in circuses (Exp. C, D). The economic profitability of the sea lions in circuses is difficult to estimate, although some experts suggest that the profitability should be fairly high (Exp. C, G).

Experts respond differently to the question whether the housing conditions meet existing guidelines; some respondents indicate that they are not aware of guidelines (Exp. A, B), whereas Exp. D indicated that guidelines are met. Some (Exp. B, E, F) refer to guidelines of European zoos (sea lions should be able to dive at least as deep as twice the length of the largest animal, which is supposedly difficult to realize in circuses) and guidelines of individual countries. State vets in DE, SE, DK, BE, FI perform random inspections (Exp. C). One expert stated that the majority of circuses in the EU probably would comply with the US Specifications for the Human Handling Care Treatment and Transportation of Marine Mammals (Exp. D).

5 Expert opinion on welfare state and recommendations

There is a wide variation in opinions on animal welfare in the general public and this variation may be more or less reflected in the answers of the experts as well. To get an impression of the expert attitudes regarding the use of sea lions in travelling circuses, we asked their professional judgement on the overall welfare state and welfare priority risks.

5.1 Welfare state

Both questionnaires contained the following item on welfare scores: *How would you characterise the average/typical overall welfare state/score for sea lions in travelling circuses in Europe (on a scale from 0, very poor, to 10, very good), and what would be the range?*

Answers to this question illustrate the personal reflection of the experts on their knowledge and intuitive and professional interpretation of the facts. Their interpretation may also reflect their personal frame of reference and what the experts considered to be morally acceptable. The score range was to represent the overall welfare score of the 'poorest' sea lion(s) in travelling circuses in Europe, while the maximum expressed the welfare of the sea lion that was best off during its life time. The answer to this question illustrates the experts' perception of the overall welfare state of sea lions in travelling circuses.

The 16 out of 20 experts that answered the question were divided on whether or not the welfare of sea lions in travelling circuses is adequate. Their replies to this question could roughly be divided into three groups. Four experts did not score but yielded qualitative statements as 'don't has to be bad by definition' (Exp. E&F), 'Fair to ok, basic needs met to a minimum' (Exp. G) and 'poor welfare' (Exp. 1). Six experts (Exp. A,C,D,10,11,13) had a score range starting above 5.5 and generated an average overall welfare score of 7.5. Six others (B,2,3,4,5,6) had a score range staying below 5.5 and generated an average score of 2.7. In support of their statements, the six lowest scoring experts mostly pointed towards discrepancies with natural living conditions of the species.

5.2 Welfare recommendations

Both questionnaires contained the following two questions on welfare risks:

1) *Could you please identify up to 5 welfare priorities (i.e. major welfare risks associated with keeping sea lions in travelling circuses)?*

This question is relevant for assessing sea lion welfare because it shows what are the main welfare issues according to the experts. The brief answer is that 16 experts specified in total 66 welfare priorities. These overlapping priorities were classified in a set of 20 labels. Results are presented in table 1.

2) *Could you please identify up to 5 welfare measures/requirements which you would recommend considering in order to safeguard the welfare of sea lions in circuses (if at all possible in your opinion)?*

Fourteen experts specified in total 56 welfare requirements. Six experts stated that it was not possible for them to recommend minimum requirements because they considered reaching an acceptable sea lion animal welfare state in travelling circuses a mission impossible in itself. The overlapping

requirements were classified in a set of 18 labels. For this the same labels were uses as those used for classifying welfare priorities (but for several n was 0). Results are presented in table 1.
By and large this list of requirements overlapped with the list of welfare priorities. One notable exception was transport, which was labelled only once in the requirements. This is remarkable, because transport requirements were regarded as a main regulatory aspect in Scandinavian countries according to Exp. C (e.g. requiring remote thermoregulatory control).

Table 1
Factors with the potential to cause poor welfare according to experts (number of experts)

Hazards	Welfare priorities (n=16)	Requirements (n=14)	Total
Pool dimensions	12	11	23
Space	11	10	21
Social conditions	10	6	16
Food	8	6	14
Water quality	9	5	14
Health care	9		9
Transport	7	1	8
Thermal comfort		6	6
Enrichment		5	5

6 Overview of the literature

The overview of the scientific literature on the welfare of sea lions in travelling circuses can be extremely short. To our knowledge no scientific studies have been reported in either the peer-reviewed scientific literature or in science-based reports, at least not specifically reporting any major welfare problem of sea lions in travelling circuses in Europe. We did, however, find a few peripheral studies and case-reports, which are briefly presented and discussed below.

Kastelein and Wiepkema (1988) recorded routine or stereotyped behaviour in all Steller sea lions (*Eumetopias jubatus*) at Harderwijk, the Netherlands, except for the youngest (and not yet weaned) female (n=7). Stereotypies involved using a ‘fixed swimming route which was maintained for some minutes or for up to an hour. Each successive cycle in the swimming routine had a very constant duration (about 30-35 sec.)’. This behaviour was shown to be significantly increased during non-training weeks as compared to weeks in which the animals were trained. Most notably, therefore, this study showed that training (which is done relatively intensively in circus sea lions) is beneficial for welfare in captive Steller sea lions, suggesting that stereotyped pattern swimming might be associated with a lack of stimulation, possibly due to spatial restriction.

Smith and Litchfield (2010) collected data on the swimming patterns of a breeding pair of Australian Sea Lions housed in Adelaide Zoo, Australia. A 9 year old male (220 kg) and a 9 year old female (75 kg) were kept together in a 60,000-L pool (1.05 m max depth, 12 m max length, 6.4 m max width), filled with moderately saline water (8,000 ppm), haul-out sites, and a beach area. During the initial baseline phase, the male sea lion showed stereotypic pattern swimming for about 45% of the total scans. The female, by contrast, displayed negligible amounts of stereotypic behaviour, spending a comparable amount of time (45%) engaged in random swimming.
The introduction of enrichment objects (food related and non-food related balls) noticeably reduced pattern swimming in the male sea lion by almost 30%. The authors concluded that with a dive depth of about 1 m, the pool probably was spatially restrictive for an adult male Australian Sea Lion. The male was unable to perform natural swimming patterns that include pushing off, full strokes through the water, or gliding. This case-report suggests that pool size may induce stereotypic pattern swimming in sea lions when pool dimensions do not match animal dimensions.

Other indications that captive sea lions may develop stereotyped behaviour in response to inadequate circumstances are presented by Joury et al. (2011). They reported a regurgitation problem in the 8-year-old, castrated male California sea lion (Zoo d’Amnéville, France). Although it is normal for sea lions to regurgitate to get rid of undigested food, such as fish bone fragments, this sea lion was leaving the performance sessions to regurgitate and consequently lost a lot of weight, going from 130 kg (287 lb) down to 86 kg (190 lb) at his lowest point. It was observed that he only started to regurgitate when having access to water. Because the authors associated the problem with boredom they taught him many new behaviours just to keep him occupied. Even though his weight increased, regurgitation could not be reduced until they additionally offered him a huge container of fish, up to 20 kg at once. The satiation program appeared to work very well and regurgitation time dropped from 42% to 12% within the first month of implementation. The sea lion then continued performing shows, and seldom left the show or a training session to regurgitate. This case-report suggests that in sea lions a lack of being satiated, in combination with boredom can lead to abnormal behaviour, regurgitation, in this case.

Rose et al. (2009) presented information on sea-lion survival rates: “The annual mortality rates of seals and sea lions in captivity range from 2.23 percent for Steller sea lions (*Eumetopias jubatus*) to 11.6 percent for northern fur seals (*Callorhinus ursinus*). Average annual mortality rates for pinnipeds in captivity (older than one year of age) have been calculated to be 4.3 percent (South American sea lion, *Otaria byronia*); 5.5 percent (California sea lion) (Small and DeMaster, 1995a; Roberts and DeMaster, 2001) There is little information from the wild with which to compare the mortality rates of

captive seals and sea lions, but from limited data, captive Steller sea lions seem to show mortality rates similar to or lower than their wild counterparts (York, 1994; Small and DeMaster, 1995a). Mortality rates of captive-born pups for some species, such as the California sea lion, are lower than in the wild, California sea lion pup mortality in captivity is 14.2 percent (on average), while mortality rates in the wild are much higher—the result of a high level of hookworm parasites in pups. See http://www.afsc.noaa.gov/nmml/california/research/ccepresearch.php?url=nmmlccep0808; (Small and DeMaster, 1995a); see also (Small and DeMaster, 1995b) For other species, captive pup mortality rates are relatively high. Two-thirds of captive South American sea lions (*Otaria byronia*) die in their first year, a rate that may be higher than experienced in the wild. South American sea lions in captivity have a pup mortality rate of 66.2 percent (Roberts and DeMaster, 2001). Few, if any, of the pinniped species typically held in dolphinaria, aquaria, and zoos (notably harbor seals and California sea lions) are captured from the wild anymore. Surplus captive-bred animals, in fact, have now become a problem in many cases [in captive environments generally], and facilities are concerned with reducing the fecundity of these species (C. Andrews, pers. comm.). Many of the currently available methods used to control reproduction may have long-term detrimental effects, and further research is needed to develop less-harmful contraceptive methods. Steller sea lions are still acquired from the wild for the most part.
Most animals, even those held in suboptimal conditions, will mate if given the chance but rearing their young may be critical. While unsuccessful attempts at breeding may indicate that a species has problems with fully adjusting to captivity, successful breeding in itself does not guarantee adequate circumstances in all aspects. The main message is that reproduction and longevity do not appear to be a problem for sea lions in particular.

A final point of concern is eye problems, which appeared to be recognized as a potential risk for the welfare of sea lions in travelling circuses. Pinnipeds are one of the few mammalian species able to see well both above and below water. In addition, they also maintain useful vision in the dim light environment of deep dives. Although sea lions, as a member of this clade, have morphological adaptations supporting these divers functions, they are also known to develop ocular disease in both captivity and the wild. In a retrospective study of globes from 70 pinnipeds, including 50 California sea lions, Miller at al. (2013) described the type and frequency of ocular disease. Cataracts appeared to be the second most common disease, second to corneal disease, with 35 globes from 23 affected animals. The majority of animals were captive (16 of 23). Overall, 22 of the 27 (81.5%) captive pinnipeds had ocular disease compared to 13 of the 37 (35.1%) wild pinnipeds. According to the authors, these numbers suggest a higher risk of ocular disease in the captive pinniped population, but they also point to the possibility of selection bias.
Sea lions in captivity may be exposed to excessive amounts of ultraviolet (UV) radiation both from inadequately shaded, outdoor areas as well as from reflection of water. Light blue-coloured pools and resting places, meant to showcase animals better, do not significantly absorb UV (Stoskopf et al., 1985). Dangerous levels of UV radiation have even been found to penetrate more than 1 m in clear water (Smith and Baker, 1979; Fleischmann, 1989). Swimming in shallow water therefore does not protect sea lions from the damaging effects of UV. It is hypothesized that chronic exposure to UV is a factor that exacerbates corneal disease in this species, although it is unclear whether or not UV is the primary aetiology for all of these findings. Eye problems in pinnipeds have a multifactorial origin including the following risk factors age (>or= 15 years), history of fighting, history of ocular disease as well as insufficient access to shade (Colitz et al., 2010, Gage, 2011).

In conclusion it can be stated that there is some but not much evidence in the grey and scientific literature of potential risks to the welfare of sea lions in captivity, albeit not specifically kept in travelling circuses. Hazards which are referred to include a lack of complexity and stimulation, a low level of satiation, a small pool size and overexposure to UV light. But even if these causes can be eliminated by the provision of adequate facilities and training, it can be questioned whether sea lions in circuses perceive a life of quality.

7 Discussion and conclusions

This study presents an overview of the findings and views on keeping, training and performance of sea lions in travelling circuses and the consequences for their health and welfare, based on literature and ('hands-on') expert opinions.

Basically, three questions are relevant to address (see chapter 2), which have been summarized and discussed in the subsequent three sections 7.1, 7.2 and 7.3.

7.1 Biological characteristics of sea lions in their natural habitat

Taking the biological characteristics of sea lions in their natural habitat as a starting point, it can be concluded that sea lions are social species living in groups, consisting of multiple females and one to several males who defend the territory. Sea lions are diurnal, polygynous, opportunistic carnivores living in saltwater along shorelines and beaches in temperate climates. Because sea lions cannot sweat or pant, they use their exterior environment for thermoregulation.
Sea lions are considered intelligent and playful animals that learn quickly from their experiences. Their physical living environment is complex and consists of beaches, flat rocky shelves or cliffs with tidepools and boulders and shallow water. California sea lions often congregate on man-made structures (piers, oil platforms etc); they tend to inhabit places which have undergone human intervention.
Depending on food availability sea lions are non migratory, deep diving is largely governed by the water depths available. During foraging trips sea lions spent half of their time at sea and the other half at haul-out areas.
Sea lions have well developed sensory powers (sound compression waves, movement vibrations, water turbulence) that are likely to aid prey detection, particularly in low light conditions. Their eyes are anatomically adapted to the low light conditions in water. Sea lions can detect and differentiate odors. Nose-to-nose contact is important in social communication and recognition. Because sea lions cannot sweat or pant, they must alter their exterior environment in order to thermo regulate. Mothers nurse their pups until weaning at 8-12 months of age. The maximum lifespan recorded in wild sea lions is 16-20 years for males and 25 years for females.
Based on the above we conclude that sea lions are very adaptive, sensitive and opportunistic semi-aquatic carnivores that live in complex social and physical environments where they spend ample time on swimming, diving and foraging on prey which is irregularly distributed.

7.2 The behaviour and health of sea lions in travelling circuses

We found no empirical studies that provided evidence on the welfare and health status of sea lions in travelling circuses. Studies in sea lions in captivity refer to hazards like a lack of complexity and stimulation, a relatively low level of satiation, a small pool size, bad water quality and overexposure to UV light. Eye problems and abnormal behaviour are mentioned as animal based welfare indicators. A few case-reports on captive sea lions in zoos point to potential welfare problems like regurgitating and pattern swimming. Such stereotyped behaviour may be associated with frustration and boredom that arises if captive animals have insufficient opportunities for exercising and/or foraging. Since information on the prevalence and impact of possible behavioural or health problems in sea lions is absent, there is at most a qualitative basis for the assessment of welfare risks in sea lions kept in travelling circuses. Compared to a zoo environment, a circus environment is likely to be more

demanding but provides more stimuli as well, it is unknown whether sea lions in a circus express signs of maladaptation. Because of the special circumstances, caution should be exercised, in extrapolating data from zoos and dolphinaria to travelling circuses.

The questionnaire results suggest sea lions in travelling circuses generally have a pool in a transportation truck, a main swimming pool and a shaded haul-out (resting) area. Exp. C, who is travelling with sea lions, claims that he meets the German standards by providing his three sea lions a main swimming pool of 50.000 litres. For transport, Exp. C indicates to use a custom built trailer, including a 5 m. long pool for longer journeys. The trailer is well ventilated, and constructed on an air-suspended truck. It contains on-board surveillance cameras and most travelling occurs during sleeping times of the animals. Although the water in the trailer (Exp. C: 25.000 litres) can be easily replaced, sea lions are normally transported with their swimming pools empty. Being semi-aquatic, sea lions can be transported for many hours dry and without swimming water as long as thermal regulation is adequate (Exp. D). This is confirmed by UK-guidelines (DEFRA, 2012a) that specify animals should only travel when thoroughly dry to reduce the risk of pneumonia, but care should also be taken to avoid overheating. Sea lions in travelling circuses in the Netherlands are probably mostly transported over short to medium distances (up to several hundred kilometres).

Sea lions in circuses mostly live in small stable family groups (n=2-4) and are fed about 6 kg of good quality fish per day by hand in several portions (e.g. 3-4 times). They are trained using target training, which basically involves positive rewards with food being the primary reinforcer. Keeping sea lions is likely to be expensive in terms of facilities (pool, filter, transport) and food (about 6 kg of consumption quality fish per animal per day). Circus sea lions are for the most part likely to be valuable for their owners, not only economically, but also emotionally. Within the constraints of the circus, sea lions therefore probably get the best possible care.

In conclusion, many hazards are listed by experts as possible causes of poor welfare for sea lions in circuses, including a lack of complexity and stimulation, overexposure to UV light, a relatively low level of satiation, a small pool size and bad water quality. To what extent these hazards result in clinical problems remains to be answered.

7.3 Differences between natural and circus environment and opinions on animal welfare

In contrast to the lack of empirical studies in circuses, there is plenty of literature describing the behavioural repertoire of sea lions in their natural habitat. In the absence of good scientific data on animal based indicators of the welfare of sea lions in travelling circuses, experts take the species specific behavioural repertoire as a starting point and use their scientific judgement to interpret the available (peripheral) data and theory in view of the constraints, associated with a circus environment, synthesized with personal experience, personal interest and personal values. These heuristics, however, may strongly have biased the experts' views (O'Hagan et al., 2006).

Nevertheless, the experts seemed to agree on the major threats (hazards) to the welfare of sea lions in travelling circuses. *Pool dimensions*, *space*, *social conditions*, *food* and *water quality* were mentioned as the top-five potential causes of poor welfare. Exposure to UV light seemed to be a major threat as well, partly because of a lack of shade but also because of insufficient absorption of UV-radiation in clear shallow water. Coastal waters are the natural habitat of sea lions and these waters are characterized by a low penetration of ultraviolet radiation, depending on chromophoric dissolved organic matter (CDOM) (Tedetti and Sempéré, 2006). The UV-radiation in water is filtered by CDOM similar to the filtering of UV-radiation by ozone in the stratosphere. Because pools in travelling circuses are filled with clear water, having depths of about 1 m, it is hypothesized that sea lions are exposed to relatively high levels of UV-radiation, on the long term possibly having detrimental effects on ocular health.These factors evidently associate with the relevant characteristics of the sea lions' natural habitat and the restrictions by keeping sea lions in a circus environment.

As far as a qualitative judgement of hazards is concerned, experts expressed comparable opinions. In chapter 5.1., however, the experts' provided an overall score on the welfare of sea lions in travelling circuses. Their scores diverged into two contrasting clusters, possibly reflecting positive (PRO's) and negative (CON's) personal attitudes towards the use of sea lions in travelling circuses.

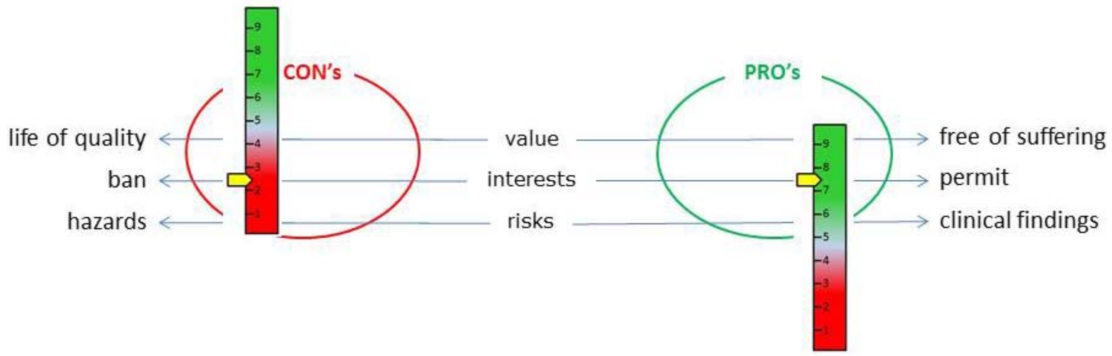


Figure 2: Three dimensions of the frame of reference, affecting expert opinions on animal welfare

Experts were found to have different perceptions of the (potential) risks to the health and welfare of sea lions kept in travelling circuses. From the twelve experts that scored the general welfare state of sea lions in travelling circuses, 6 experts scored relatively high and scores went from 5.5 upwards. In contrast, the other 6 experts scored relatively low and scores went from 5.5 downwards. Some experts emphasized the discrepancies between the quality of life sea lions may experience in either a travelling circus or in their natural habitat. Other experts views seemed to be substantiated with experiences from their daily practice in working with sea lions in circus or zoo environments. We hypothesize that different positions in at least the following three dimensions (Figure 2) may underlie the divers expert opinions:

- Axis-1: conceptions of acceptable animal welfare ranging between '***life of quality***' and '***free of suffering***', called the value-axis;
- Axis-2: economic and/or emotional interests in either a ***ban*** or a ***permit*** on the use of sea lions in travelling circuses, called the interests-axis;
- Axis-3: evidence for reduced welfare ranging between ***hazards*** (factors with the *potentia*l to cause poor welfare) and ***clinical findings*** (a function of the probability of animal-based indicators of animal welfare and the impact of these consequences, following exposure to travelling circus conditions).

According to Nijland et al. (2013), the experts probably used different frames of reference for their overall judgements about the welfare state of sea lions kept in circuses. In their study of hands-on experts' perception of the welfare of animals in travelling circuses in the Netherlands, the authors conclude that the issue of animal welfare in circuses is a complex ethical problem that will not be solved as long as we do not accept it to be such a problem.

In conclusion, the issue of animal welfare concern is multidimensional and in dire need of empirical evidence ('facts'; animal-based observations of welfare indicators) as well as a thorough appreciation of the ethical and political dimensions of the problem. Given the small numbers of animals, the many non-controllable environmental factors, the mobility and the geographical distribution of travelling circuses with sea lions, conducting reliable animal-oriented research will however remain, an almost impossible task. In the midst of these different dimensions and the current uncertainty (lack of information) and dissent submitted by this report, it is up to policy makers and politicians to decide as to whether or not the use of sea lions in travelling circuses is to be banned in the Netherlands.

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Annex 1 Antecedents of unanonymous Sea Lion Experts

Expert	Species of (primary) expertise	Position(s)/function(s) (incl. relevant previous positions and affiliations)	Years of experience	Nationality	Subject area (e.g. training; performance; natural behaviour, conservation, education)	Possible conflicts of interest	Anonymously in the report?
A	Harbor porpoises, harbor seals, sea lions and walrus	Own consultancy and research	30	NL	Animal welfare, psychophysics, behaviour, acoustics	N	Anonymous input: N ;Listing in the acknowledgements: Y
B	Sea lions, elephants	Animal management Tag-chair EAZA Marine Mammal Tag; EAZA Regional Studbookkeeper for the Californian sea lion; (co-)author of husbandry guidelines for sea lions in European zoos	37	NL		Y, namely as employee of a zoo there is competition for part of the visitors	Anonymous input: N; Listing in the acknowledgements: Y
C	Patagonian sea lions;	Circus performer; involved in Scandinavian countries on sea lion decision making (SE, DK).	>40 years in family (personally: 25 years)	UK	Training; performance in travelling circus	Y, namely ... It concerns my livelihood	No objections.

D	Sea lions (Zalophus californianus, Otaria flavescens), Seals (Halichoerus grypus), Dolphins (Tursiops truncatus)), Penguins (Spheniscus humboldti) Marine aquaria	BA (Hons) Psychology with Biology; Zoo Management; Zoo Consultancy (Design, Husbandry, Training); Animal Trainer; Animal Keeper; Seal Rehabilitation; Educational Lecturer; Fellow of the Zoological Society of London; Member of the International Marine Animal Trainers Association.	42	UK	Training, Performance, Conservation, Education, Zoo Management, Animal Husbandry, Research	No. I currently have no business dealings with companies operating circuses. I have never been employed to work in a circus but have visited them on many occasions and have professional colleagues who work within this industry. However, I am familiar with the care and husbandry of sea lions in these environments and feel that I can voice an objective and professional opinion on this matter.	Anonymous input: No; Listing in the acknowledgements: Yes
E&F	Pinnipeds and marine mammals	Senior trainer and veterinarian (E and F respectively)	23 and 15	NL	Training performance and behavioural therapist (E) - Veterinary care, nutrition, behavioural problems and transport (F)	Y namely both work in a zoo with animal presentations	Anonymous input: N; Listing in the acknowledgements: Y
G	California and Patagonian sea lions, and South-African fur seals	Animal welfare consultant, care taker, research assistant and training supervisor in a variety of marine mammal parks. Now independent consultant in the animal welfare field world-wide.	22	NL	Training, education, enrichment, housing, natural behaviour, cognition	Yes, namely …owning my welfare consulting company, progressive / contemporary view on captive animal welfare. I am also against animals in circuses.	Anonymous input: No ; Listing in the acknowledgements: Yes

Annex 2 Questionnaires as sent to experts

The following extended questionnaire was sent to the first 8 experts in Nov. 2013.

No.	Sub.	Item
		***Personal* information**
1	1	Last name
	2	First name/initial(s)
	3	Species of (primary) expertise
	4	Position(s)/function(s) (incl. relevant previous positions and affiliations)
	5	Years of experience
	6	Gender
	7	Age (years)
	8	Nationality
	9	Subject area (e.g. training; performance; natural behaviour, conservation, education)
	10	Possible conflicts of interest (i.e. interests which may be taken by others to generate potential bias in presenting available knowledge/information)
	11	Do you prefer to have your relevant input presented anonymously in the report?
	12	Other relevant personal information you may want to share (e.g. main publications, internet links, C.V., etc.)
		Welfare priorities, safeguards and experts
2	1	Could you please identify up to 5 *welfare priorities* (i.e. major welfare risks associated with keeping sea lions in travelling circuses)?
	2	Could you please identify up to 5 welfare measures/*requirements* which you would recommend considering in order to safeguard the welfare of sea lions in circuses?
	3	Could you recommend up to 5 other *experts* whom you believe should be contacted on this subject as well? (Please provide names, expertise, email address and phone number (if you have it).)
		Welfare related *descriptions* (of the animals and their environments)
3	1	Are sea lions in circuses wild or domesticated? How 'tame' are they (e.g. to strangers, e.g. biting incidents?)
	2	How adaptable are they? (Level of plasticity, coping)
	3	How intelligent are they? (Cognitive abilities; practical abilities, e.g. can they be house trained?)
	4	What do sea lions like/dislike? Do they like to perform (and how is that shown)?
	5	Characterise the human-animal relationship (human attitudes; animal perceptions; human can be trainer, other circus personnel or public)
	6	Trainer qualifications (attitude, education level)
	7	Housing conditions (during performance at the circus, incl. species involved; group composition, space allowance for swimming, resting, floor types, pen fittings; filter system; climate regulation; type of food, etc.)
	8	Housing conditions (during 'winter stop')
	9	Housing conditions (during rearing and/or after 'retirement')
	10	Transport conditions (travelling frequency; distance; accommodation during travel, e.g. water)
	11	Training method and schedule; performance schedule; also training during winter stop?
	12	How long training needed before they can perform?
	13	Training objective (e.g. showing natural behaviour; training to allow medical examination; entertainment; exceeding the animal's capacities?)

No.	Sub.	Item
	14	Circus acts (how many performances per day; for how long? Variability/monotony; are they motivated to perform/train? How shown?)
	15	Until what age can they perform? What is the (average/maximum) lifespan of a circus sea lion?
	16	How much of their food do they get during performance?
	17	How much starvation is practiced for (initial) training? How long? Drop in body weight?
	18	Do the housing conditions meet existing guidelines (which ones?; how? What do the guidelines prescribe?
	19	Which guidelines exist and how are they enforced?
	20	How transparent are various welfare requirements? How can they be guaranteed?
3	21	How does the welfare of sea lions compare to the welfare of other (wild and domesticated) animals in circuses?
	22	How does the welfare of sea lions in circuses compare to the welfare of sea lions kept in zoos/marine lands/aquaria/dolfinaria, sea lions kept as pets or sea lions in the wild and in human habitats?
	23	What is the economic profitability of the circus so as to secure the ability to generate sufficient revenues to properly care for the sea lions (incl. potentially increased competition if other wild animal performances were prohibited)
		Characterise main welfare issues in relation to the various evolutionary and *life stages* of the animals
4	1	Evolutionary history / environment of evolutionary adaptation (level of discrepancy with natural habitat; level of domestication, inbreeding)
	2	(Early/previous) life experiences (born in captivity/in the wild; weaning age and method; early training experiences; changing owners/environments)
	3	Seasonal conditions, e.g. summer versus winter environment
	4	Daily activities: circus act, training, local movements (from trailer to circus ring), 'rest of the day', day time - night time) [to be considered in more detail below under '4 - Welfare needs'].
	5	Transport - from place to place
	6	Special circumstances (e.g. breeding season; unfit for travel e.g. due to pregnancy or illness)
	7	What happens to an animal that cannot cope, does not perform well enough?
		Welfare *needs* (esp. while kept at the circus)
5	1	Respiration and other climatic factors (e.g. air quality, light , noise, vibrations, swimming water quality, sweet/salt swimming water)
	2	Food (amount of food (ad lib/restricted, e.g. for training); nutritional quality (commercial food?); regularity of feeding; feed changes; feeding-related aggression; time needed to consume feed)
	3	Drinking water (quality and quantity)
	4	Thermoregulation (too hot, i.e. heat stress; too cold, i.e. cold stress; external climate control; behavioural control by the animal (can seek cool/warm resting area, i.e. availability of shade and shelter).
	5	Rest (duration (hrs./day); floor comfort (bedding); size of resting area; separate resting places for each individual; disturbances during resting; diurnal rhythmicity; can be active/at rest in accordance with natural tendency; light intensity; drainage(dry/wet),)
	6	Kinesis (movement/exercise, incl. locomotion, swimming in various patterns, diving, jumping, climbing, walking abilities); pool size (depth; length, width; shape)
	7	Play (locomotor and object play)
	8	Migration
	9	Body care (skin care; sunbathing; moulting; welfare issues related to elimination)
	10	Social contact (group size in accordance with nature/demand/individual animal preferences; (incidental) isolation; mixing of individuals/trade; family relationships, pair and mother-offspring relationships; synchronisation of behaviour)
	11	Exploration (investigation of novelty; 'wandering'; object manipulation, e.g. enrichment, substrate, toys; also space, variability;)

No.	Sub.	Item
	12	Foraging, hunting for fish/food, working for food (too much/too little, e.g. during performance/training)
	13	General stimulation level (overstimulation or understimulation, i.e. boredom; stereotypies, circle swimming; time budget (time spent on activities (esp. foraging) i.r.t. natural time budgets)
	14	Sexual behaviour (e.g. mate selection, courtship, birth control)
	15	Territorialism (lek/harem defence; aggression towards people, towards conspecifics)
	16	Maternal behaviour (mother-offspring bonding; separation e.g. during performance or trade/changing owner; unfit for travel during (late stage of) pregnancy;
	17	Safety from conspecifics (aggression related to obtaining food or other resources such as resting places and mates; separation/escape possibility (can escape from social threats/aggression)
	18	Safety from external stimuli (which are perceived as danger, esp. transport, training methods using punishment; public safety measures; can abstain from circus performance; handling procedures; veterinary 'care' (which may be unpleasant for the animals, e.g. unless trained to allow clinical examinations)
	19	Health & hygiene (disease incidents, durations, intensity of sickness; swimming water quality; filter system present/capacity (e.g. in case of diarrhoea); 'litter training'?; unfit for travel during disease problems; veterinary quality care available (specialised vet available, affordable)
5	20	Injuries, pain (e.g. lameness; wire fences; surgical procedures, e.g. mutilations, stray voltage, vaccinations, shock collars, beating, pen fittings that may cause injuries (e.g. during play/transport), floor types (slipperiness, abrasiveness), etc.)
	21	Conflicts of interest between animal welfare and human interests (e.g. between economy/contractual obligations and animal-related interests, e.g. unfit for travel due to illness; insufficient income for expensive filter system to maintain water quality)
	22	Other
		Below is a list of (classes of) *animal-based* welfare measures that may be indicative of welfare benefits and problems (these measures can be used to set welfare priorities as they relate to the intensity, duration and incidence of welfare problems)
6	1	Natural behaviour
	2	Preferences
	3	(Consumer) demand
	4	((Re-)productive performance (e.g. delayed onset of puberty; reproductive failure/performance; growth; body condition (too fat/thin))
	5	Survival/longevity, infant/adult mortality; selection pressure for performance
	6	Fitness, biological functioning (ability to cope with challenges so as to survive and reproduce)
	7	Stress (HPA-axis activation, e.g. elevated cortisol levels); incl. controllability and predictability of stressors (inducing a fight-flight-fright response)
	8	Arousal (SAM-axis activation, e.g. elevated heart rate variability, adrenaline; acute stressors)
	9	Aggressive behaviour (towards conspecifics, trainer, public, other animals)
	10	Abnormal behaviour (e.g. stereotypies)
	11	Frustration / avoidance behaviour (incl. behavioural restrictions)
	12	Sickness (reduced immunity; gastric ulcers, heart problems, parasites, infections; skin lesions (wounds, scars, loss of hair), teeth condition, eyes, etc.)
	13	Injuries, trauma, pain
7	1	**Other suggestions**
	2	How would you characterise the average/typical overall welfare state/score for sea lions in travelling circuses in Europe (on a scale from 0, very poor, to 10, very good), and what would be the range?

The following restricted questionnaire was sent to the 13 experts.

A: Could you please identify up to 5 welfare priorities (i.e. major welfare risks associated with keeping sea lions in travelling circuses)?

B: How would you characterise the average/typical overall welfare state/score (on a scale from 0, very poor, to 10, very good), and what would be the range?
Average score:
Range: from .... to .....

C: Could you please identify up to 5 welfare measures/requirements which you would recommend to safeguard the welfare of sea lions in circuses (if at all possible in your opinion)?
Possible: Yes/No,
If yes (=possible), then the 5 main requirements are:

Annex 3 Responses of Sea Lion experts (extended questionnaire)

Expert	3.1. Wild or domesticated
A	They remain always wild, as this is no domesticated species. They are tame to their handlers and sometimes to others when the handler is present. Their behaviour varies seasonally and depend on the sex and age, so no clear cut answer can be given, other than that there is always a danger.
B	Wild, biting towards trainers and trainers is possible. Think about dog incidents
C	Very tame. Although generally we don't allow the public to approach, we do allow supervised visits. No "strangers" [i.e. unfamiliar people] have been bitten in the past 25 years.
D	When handled correctly, trained and habituated, most sea lions are reliable around humans. Obviously, they are technically wild animals but they do seem to show a remarkable ability to behave like domesticated animals. This is primarily down to the skill of the owners and trainers of these animals. I doubt if any responsible owner/trainer would allow their animals to interact with other circus staff or members of the public without direct supervision as would be the case with any large domestic animal such as a dog or a horse.
E & F	This answer is hard to give in a general manner. There are species differences and individual differences.
G	Wild. Sea lions are intelligent animals and are easy to train, but training, husbandry and housing methods can affect aggression, frustration and boredom, which could result in biting and or other maladaptive behaviours such as self-harming (fur biting, flipper biting) and regurgitation as well as stereotypic behaviours.

Expert	3.2.Adaptability
A	Fairly adaptable, otherwise this would not be the most widely kept sea lion species in the world.
B	
C	Nearly all sea lions in European circuses are Patagonian sea lions; perhaps only one family in DK who has a group of California sea lions. California sea lions are more graceful, but require CITES papers and are a lot less calm and spooked more easily by e.g. noise. Russia has more species (e.g. big Steller sea lions).
D	Both species of sea lion I have worked with are extremely adaptable. Particularly (as in the case of sea lions in circuses) these animals have been habituated to this environment from early age - some sea lions currently performing in Europe were born and raised in the circus
E & F	These animals may cope with very many different circumstances. How they cope is also dependent on the intensity and methods of training.
G	Fairly adaptable but prone to stereotypic behaviour when needs are not met, including high degree of vigilance and/or lethargy. I would argue they can adapt but their quality of life would be debatable.

Expert	3.3. Intelligence
A	Very intelligent and trainable. I always make a joke that you can learn a sea lion to play the piano.
B	
C	They have a follow/pack instinct towards me. Natural playfulness/curiosity. Can solve object problems (e.g. lift an object to find fish etc.).
D	Sea lions are generally regarded as 'intelligent'. However, caution should be used when using such terms. My colleague the late Dr Ronald J. Schusterman undertook a considerable amount of work on the cognitive and sensory behaviour of sea mammals including sea lions; his work continues at Long Marine Lab at the University of California Santa Cruz. These animals have very good memories and perception powers. ; http://pinnipedlab.ucsc.edu/index.htm; A link to a video from this research may give an idea of these animals cognitive skills: ; http://animal.discovery.com/tv-shows/other/videos/extraordinary-animals-cerebral-sea-lion.htm; Sea lions could be 'house trained' but as they tend to defecate in water I can see no practical purpose to such training. That said, one technique that apparently works to stimulated defecation in sea lions was used at Marineland of the Pacific many years ago. Animals were maintained dry overnight and before being allowed in their exhibit, they were hosed down with water. This, apparently, stimulated defecation (Harrison, 1968).
E & F	We would say similar to dogs.
G	Highly intelligent animals, capable of learning abstract concepts, language and wide variety of behavioural and physiological tasks. Fast, flexible, curious and problem solving.

Expert	3.4. Likes & dislikes
A	Those in zoos are very sensitive to changes in their environment. For instance if they see a crane for construction from their pool, they are likely to be so upset that they do not participate in the next show.
B	Food, petting, hugs; some tricks, e.g. some sea lions like to jump; I'm confident sea lions like doing a show
C	Appear “happy” when performing, and natural playfulness and curiosity; generally enjoy human contact and the stimulation of training;
D	I am not aware of specific things that sea lions 'dislike' per se outside not being able to have a reasonable choice, i.e. access to swimming water and resting areas. The animals appear to enjoy playing with novel objects and toys, more so in the water.; Their behaviour suggests they like to be trained and perform. They display this by anticipation behaviour when they become aware a performance is about to take place, i.e. looking for the trainer; waiting at the gate of their accommodation; the ease at which they will willingly enter performance areas and take their positions (station); and pre-empting clues for behaviours.
E & F	Sea lions like to perform. If they are excluded and aware of it they will demonstrate frustration behaviour. In performances they are enthusiastic and curious. However, this is again dependent upon the animal-human relationship and training methods applied. Good trainers make good relationships. Sea lions dislike it if they are withheld the opportunity to swim. Water is their safe haven amongst others.
G	They are social animals and sometimes engage in antagonistic behaviour, including towards the human caretaker. They dislike monotony, bad fish quality, incompatible social groups and being alone locked away (unless when housed in an incompatible social group). They often enjoy presentations as it adds value to their day, keeps them busy and (the only) access to fish (so they might therefore want / need to participate). They often show anticipatory behaviours like walking back and forth, swaying, stretching out to see where the trainers are, and expressing eagerness to participate.

Expert	Humans	Humans
	3.5.Characterize the human-animal relationship	3.6.Trainer qualifications
A	See 3.1	Attitude: needs to be alert all the time and focussed. MBO level at least.
B	There is a relationship with the trainer, based on training and acceptance of the trainer in the environment based on this	Should be experienced in training, preferable on marine mammals. Should be educated in and understand the principle of positive reinforcement training. Should also be familiar with the traits and needs of the (sub)species
C	Sea lions appear to be constantly stimulated/moving/swimming. Other personnel could present them with training. Very attached to me and vice versa.	Sea-lion trainers in circuses often have close contact with trainers/handlers in other areas; Zoos, Dophinariums and seal rescue centres such as those on Holland's coast. This often results in ideas and methods being exchanged as well as experiences gained; ; My family and I have been transporting and keeping sea-lions throughout Europe for over 40 years with excellent results. We have often been consulted by zoos, safari parks and seal rescue centres about how to best transport for sea lions, as well as where to purchase the type of pools that we use, when they need a temporary solution for keeping their animals.
D	This is an interesting comment. I have long held the view (and discussed this with colleagues) that many circuses animals have very close and intimate relationships with their trainers. This observation extends to sea lions. These relationships are more akin to that of the relationship of a pet/companion animal and its owner than that of the relationship of a zoo animal to its keeper. This is probably because circus trainers literally live with (or are in close proximity to) their animals 24 hours a day, unlike a zookeeper. While many zookeepers do have good relationships with their animals (for many it is a job they enjoy), they go home to their family at night. In a circus, the animals and their trainers and keepers consider this a lifestyle and not just a means of employment but a community of which the animals are an integral part.	Many animal keepers in zoos are educated to degree level. However, in a circus environment many skills such as animal husbandry and training are handed down from family members to other family members - similar, in some ways to an apprenticeship. This, in itself, can be of a greater value than an education to degree level.
E & F	Animals and humans are seemingly part of a social group. There is a lot of trust between sea lions and their trainers.	Trainers should be aware of positive reinforcement training. An understanding of basic training principles, body language and modern training methods is essential. This understanding can be obtained by experience in practice with or without schooling. Personality of the trainer is important in this matter. A feeling for animals must be there.

Expert	Humans	Humans
	3.5.Characterize the human-animal relationship	3.6.Trainer qualifications
G	They can be trained to work and be around all kinds of people, public, trainers and others. If they are socialized well this should not have to result in problems, but of course public behaviour is not always predictable. I would want to know what methods they use to train the animals, whether excessive food deprivation is used, or social isolation to increase trainability, but decrease social opportunities. Often trainers separate animals during the day (sometimes night too) to make training easier.	Background in animal care as a minimum, like a zookeeper education. Preferably extensive animal training experience with positive reinforcement (not excess food deprivation which is still often used). High animal welfare standards (which are hard to meet in a circus environment), understanding animal behaviour and learning. Knowledge of food quality, behavioural observations, environmental enrichment, animal behaviour, cognition & affective states.

Expert	Housing	Housing	Housing
	3.7.Conditions during performance at the circus	3.8.Conditions during winterstop	3.9.Conditions during rearing or after retirement
A	During performance, there are very few requirements, as these animals in the wild are used to rough environments.	At least a large saltwater pool. (see 2.2)	see 2.2
B	See draft minimum guidelines (these are under discussion so could change!!!)		
C	It is relatively easy to provide facilities for stimulation to keep the animals in excellent physical and psychological health; facilities incl. mobile pool can be built within 30 min. after arrival and dry resting places; 50.000 litre main pool takes about 1hr to fill up with a fire hydrant; inside the trailer we have a 25.000 litre pool, which is filled up first after transport; we also have a nursery pool (1.000 litres) for pups;	Sweden. A large hall is hired to build up all pools.	Sea lions retire from performing, but stay within their known circle. Pups and mothers are separated from males during rearing.
D	Most sea lions' set-ups in a circus consist of lorry transport with both dry and wet (pool) accommodation. Large- volume prefabricated swimming pool(s) with accommodating extra land areas are also supplied during stops at performance venues. Stand-off barriers are also included for the safety of both animals and visiting public.; An example sea lion accommodation is pictured below. - As far as I am aware, the current species of sea lion displayed in European circuses are either California sea lions (Zalophus californianus) or Patagonia sea lions (Otaria flavescens). A number of the older animals were	Most sea lion trainers I am familiar with have areas to accommodate animals at their permanent homes and/or property.	Sea lions can and do breed and successfully rear young in a circus environment. ; Females can work (perform) more or less right up until parturition. Newly born animals generally are separated with their mothers. The duration of time is a judgement best made by trainers familiar with the individual and their temperament. ; In both the wild and captivity, female California sea lions will come into oestrus within a week or 10 days of giving

Expert	Housing	Housing	Housing
	3.7.Conditions during performance at the circus	3.8.Conditions during winterstop	3.9.Conditions during rearing or after retirement
	obtained from the wild. However, current recruitment now comes from captive breeding.; Group composition can be flexible. One mature male and female(s) with juvenile young will coexist well. However, problems may be encountered when more than one mature male is housed with mature females during the yearly breeding cycle. Nonetheless, single sex groups' work well even when comprised of mature male animals.; Sea lions tend to be gregarious and generally enjoy each other's company even to the point of sleeping on top of each other. See pictures of wild California sea lion at Pier 39 in San Francisco [e.g. at http://en.wikipedia.org/wiki/Pier_39]. Note the wooden boards; sea lions seem to prefer to sleep on wooden platforms and it is a common practise to provide these in zoos.; With modern technology, it is now possible to provide these animals with large swimming pools when stationary at performance venues. Swimming area is more important than depth for these animals. These pools are of a volume to allow some form of filtration process e.g. high-pressure sand filters, although periodic replacement of fresh water from a public main water supply is also satisfactory.; Access to salt-water bathing can be beneficial although animals have been successfully kept without access to saltwater with no evidence of harm to welfare; some consider salt water bathing is useful for maintaining eye health. At least one marine mammal veterinarian I have worked with considered sea lions could benefit from periodic exposure to both fresh and salt water (Taylor, Personal Communication).; Hypernatremia has been seen in seals maintained in fresh water (Geraci, 1972a). Some faculties do give the sea lions salt tables but many do not, without any problems.; A number of European countries set minimum standards for wild animals in zoos - and some specifically for circuses such as Germany, France and Denmark. The UK introduced specific welfare guidelines for circuses in 2012. - Under the UK government's Zoo Licensing Act specific husbandry requirements are codified in the Secretary of State's Standards of Modern Zoo Practice; sea lions are specifically addressed	Areas of land (and in many cases, cover barns and so forth) are used. The travelling facilities can be set-up in such situations and are completely adequate for the animals' needs.	birth; males will then compete to mate with them. Animals in this situation need to be watched as the male will sometimes try and force his attentions on the female even after he has successfully mated with her - therefore temporary separation may be required. Time of separation is best judged by the trainer of the animals, more so if they have experience with previous births.; Nursing females do not require large amounts of space. A small pool can be provided but care should be taken with young pups as they can sometimes drown in deep water. Pups have to learn to swim.; Sea lion pups tend to be very precocious from birth. Rearing the young does not mean that females cannot be separated from their pups to take place in performance after bonding with the pup has taken place. ; In the wild females will leave the pup for considerable periods (many hours) while she hunts for food. In my experience, females with pups tend to wish to return to training and performance within some days of giving birth. In one situation in a zoo, I had a female scale a dividing fence to take part in a performance despite the fact she was receiving ad-lib food during the day while she nursed her pup. In the early days, pups spend a considerable amount of time sleeping between nursing. ; [Some more] papers ... published on sea lions breeding are linked here: ; (Dineley, 1979); (Dineley, 1982).; Sea lions can and do continue to work for most of their active lives.; Animals should only be considered for retirement if they have developed disabilities; such judgements need to be

Expert	Housing	Housing	Housing
	3.7.Conditions during performance at the circus	3.8.Conditions during winterstop	3.9.Conditions during rearing or after retirement
	in Section 8.4 Pinnipeds and marine birds (pages 47 - 49): (DEFRA, 2012a) - The US government has also codified welfare requirements for captive marine mammals (USDA, 1979).; Sea lions are cosmopolitan in their diets and in captivity do well on fish such as herring, mackerel and sprats; they will also take squid. Modern freezing allows these to be readily available to circus sea lions. Supplementation of some vitamins such as B1 is now a standard practice due to the production of thiaminase that can occur in frozen herring (Geraci, 1972a; 1972b). - You may find this overview linked below helpful: (Stoskopf, 2012). - There are commercially available supplements for fish eating animals such as Aquavits from the International Zoo Veterinary group and Mazuri fish eater tablets. I have used both with equal success on pinnipeds.; As I said, I never have had any observable problems with animals in fresh water as regards hyponatremia and the need for salt supplements. To be honest, giving animals the opportunity to salt water bathe occasionally may be more beneficial - but this relates to eye health as much as nutritional health.		undertaken by their trainers and suitable veterinary advice. ; In my opinion, removing healthily animals from the routine of performance can be a negative experience for them psychologically. If retirement is considered then animals should be maintained in an environment that at least complies with the standards given to them during their working lives.
E & F	This question is too general and large to answer in a short manner. In general housing conditions should be such that the animal can be active, have normal social relationships and is comfortable. Housing conditions should not lead to a negative attitude or behaviours (aggression, stereotypies, etc.)	See above	See above
G	Should have appropriate social groups, husbandry guidelines EAAM can be used / consulted for the items in this category.	To my opinion same as summer schedule, but if this very restricted during summer activities then equivalent of housing of sea lions in a zoo.	Equivalent to housing sea lions in a modern zoo.

Expert	3.10.Transport
A	During transport, cooling is very important. When the temperature is OK, the travel time is irrelevant up to a journey of one day.
B	
C	Custom built trailer, includes a 5 m. long pool for longer journeys, a separate dry area (about 8 x 2.5 m., used if the animals need to be examined, or separated), and a filter system for use with the outside pool. The trailer is well ventilated, and constructed on an air-suspended truck which gives a smoother ride; contains on-board surveillance cameras; most travelling occurs during sleeping times of the animals;
D	From information I have seen, most travelling circuses plan their routes and performance venues to be reasonably close together so animals tend to be subjected to maybe one to a maximum of three hours travel. It is also customary in circuses with animals to ensure that animal accommodation is erected as a matter of priority when arrived at a new performance site. The only long duration of transport that they may have to undertake would be the beginning and end of the performance season from the owners' permanent home or property.; All circus sea lion trainers I am familiar with have transportable accommodation units. In general, these are large trucks. These would include food storage (freezer units) and preparation area; a dry land area and a pool; this is in addition to the large prefabricated pool(s) that would be erected and additional land area that would be supplied when stationary at a performance venue. ; Because animals are housed in purpose built accommodation, which includes both water and dry resting areas, long journeys present a much lower welfare risk than if the animals were commercially transported in boxes or crates. NB: sea lions are normally transported with their swimming pools empty. However, these can be easy filled for stop-over occasions.; Being semi-aquatic, sea lions can be transported for many hours dry and without swimming water. However, thermal regulation for sea lions is important and accommodation needs to have the facility to be well ventilated when required. ; Animals should be checked periodically and if appropriate can be sprayed with water or hosed down.; Sea lions (like many other marine mammals) derive their dietary water from the food they eat. Therefore, supplying them with drinking water would seem generally unnecessary particularly if they have regular access to swimming water.
E & F	Dependent upon habituation, length of transport and frequency of transports.
G	

Expert	Training		
	3.11.Training method and schedule, performance schedule	3.12.How long before they can perform	3.13.Training objective
A		That depends entirely on the animal, and the number of behaviours you want to show (train), and the complexity of the behaviours.	From the animal's perspective, the goal of the training is unimportant. However, it is always good to train a number of husbandry behaviours such as "gating", allow eye drops, allow physical examination, allow blood sampling.
B	We use target training (2 targets are often used with two colours, but sea lions are colour-blind); should use positive reinforcement (sea lions can be dangerous for humans); we use different performance blocks (variation over days and even per show);		Should never exceed the animal's capacity
C	Target training and positive reinforcement (using food, pets and verbal rewards), provides a challenge and stimulation; same method as used in marine centres, zoos and dolfinaria.; Also training sessions open to the public, involving close contact between animals and public, and education (e.g. about environmental issues);	Approx. 2 - 3 years depending on the individual.	First 1-2 years are spent socialising (playing) with animal. Many of those behaviours (sliding, pushing with nose, object retrieval) are used in performance. Simple target training allows for medical examinations.
D	The recognised training method for sea lions and other animals is the use of Operant Conditioning as conceptualised by B F Skinner [(Skinner, 1938)]. These techniques are well understood and have been developed over the years by people such as Karen Pryor (Don't Shoot the Dog, 1985) [(Pryor, 1999)]. ; Food reward is the key component. With sea lions, this is very effective as they are opportunistic feeders in the wild and will consume considering more nutrients and calories then they require for sustainability and good health. This, along with their well-developed cognitive skills, they are very easy animals to tame, train and interact with. ; Physical punishment of animals like sea lions is not only unethical but counterproductive and can (as with many other animals) lead to animals that are unreliable in temperament and physically dangerous to work with.; It should be noted that young animals reared within a circus environment would have already under gone some training	Sea lions can start their training from the time they are weaned. Basic behaviours can be established within a few months. The first priority could be to train the animal to enter and leave the performance area and whilst there to 'station', which is the animal sitting comfortably in a prescribed place. ; Because of the busy nature of a circus environment animals quickly become desensitised to strange phenomena and situations. In some cases trainers will carefully	Most if not all behaviours sea lions display are variants on natural behaviour. Even behaviours such as ball balancing and catching objects demonstrate the very fine coordination skills these animals have. ; Indeed, these animals can be trained to undertake many medical and husbandry behaviours that limit stress in ascertaining their welfare.; Empathic trainers know when animals are being asked to perform behaviours beyond their skill set. ; This has been well known since the publication of Breland and Breland (1961) The Misbehaviour Of Organisms. ; Most sea lion performance tends to demonstrate the skills of the animals; comic components of routines generally have the trainer as the clown

Expert	Training		
	3.11.Training method and schedule, performance schedule	3.12.How long before they can perform	3.13.Training objective
	processes by habituation to human care takers via their adult conspecifics and also observational learning.; Performance ranges from one to up to five performances a day; the schedule is very similar to that of animals in public displays in zoos and aquariums. However, it tends to be shorter in duration. Training is an on-going process and sea lions certainly appear to have the ability to learn new behaviours and concepts into maturity and beyond.; Training new behaviours tends to be undertaken in small time periods; it is important to establish small increments of progress with animals when developing complicated routines and behaviours; techniques referred to as 'shaping' by 'successive approximation'.; An animal's training is progressive and generally continues throughout the year whether the animals are in winter quarters or publicly performing.; Pryor's book cited above [(Pryor, 1999)] gives more detailed explanations of the process. ; [Some more] useful background on this subject: (Dineley, 1997).	introduce such events to the animal in a similar way to animals used in public service, e.g. police horse and dogs.	not the animals.
E & F	Training should be constant also with the goal to provide challenges, enrichment and mental stimulation. Training method and schedule should be such that they evoke a positive attitude in the animals and not a negative one or negative behaviours. It is difficult to put this in numbers and very dependent upon the situation, the animals (characters) and trainers.	Depends on the animal and what you want to show. In some instances behaviours can be trained in weeks; in others it may take months.	All objectives are possible as long as they are not negative to the animals' health, or disliked by the animal. The only valid reason to train a behaviour an animal dislikes is if it is in the animal's own interest (blood sampling for example).
G	Positive reinforcement based, schedule can vary, training all year round, training including play, cognitive games, breath holding (training / exercise for a good cardio-vascular system), etc. To ensure physical and psychological welfare. The performance schedule should be adequate / reasonable. All animals should be trained to know different behaviours. Often people train 1 behaviour with 1 animal and another behaviour with another animal. This means that often all animals need to perform to complete the show.	The training period depends on the behaviour, animal and trainer's skill. Can be a few weeks to longer.	For me the training objectives should be focused on natural behaviours, husbandry training and portraying the animals in a species specific manner. These behaviours can be used to "entertain" people. All hoops, balls, etc. should be avoided until more research has been conducted on the impacts of entertainment on animal welfare and conservation. See publication by Hare

Expert	Training		
	3.11.Training method and schedule, performance schedule	3.12.How long before they can perform	3.13.Training objective
	This also means no days off, active day-off planning with other activities / enrichment is also something to consider.		attached (Schroepfer et al., 2001).

Expert	Training			
	3.14.How many acts per day	3.15.Until what age can they perform	3.16.How much food during performance	3.17.How much starvation is practiced before training
A	5 shows per days is OK. Monotony is no problem in the shows, but after the shows if the animals are not properly housed.	They can become up to 25 years and can perform until the last day of their life if they are healthy. Males usually get less old than the females.	That is irrelevant, it depends on the length of the show and the number of behaviours they have to perform.	No starvation is necessary to train a sea lion. Just divide the food over the day.
B	Vary shows as much as possible; accept resting periods	??? Animals will start performing less, less interested/tired when on older age. Will depend on individual animal	Depends on time, animal etc. but animals should never been deprived of their daily portion!!	Never use starvation!!!!
C	Summer periods: 1-2 show per day, Winter weekends: 2-3 shows per day. 8 minutes duration per show. Behaviours are varied, and new behaviours are taught every winter.	Until they die; last male died at an age of 27 years (had a tumour); they can reach an age of about 30 y.	50%. They are fed 4 times per day. I provide a morning feed including vitamins/supplements and 1 night /"bedtime" feed.	None. This technique would result in animal refusing to perform when full/starve to make perform cycle.
D	Circus performance is generally twice a day although in some cases this can be up to four times a day - but this is exceptional. Performance times average around ten minutes. This compares well with public shows and training demonstrations in zoological collections.; Sea lions seem to demonstrate high levels of motivation to perform by their eagerness to enter the performance area and sometimes anticipation at reading	Sea lions (without health issues that could be age related) can perform until the time of death. ; No data exists for circus sea lions survivorship, but anecdotally they appear to survive to the same length as animals housed in zoos and aquariums. ; The NOAA [(NOAA, 2013)] state that wild California sea lions can live 20-30 years.; http://www.nmfs.noaa.gov/pr/species/mammals/pinnipeds/californiasealion.htm;	Food allowance can vary depending on the number of performances. The animals are generally allotted a set amount of food a day with any residual being fed to them at the end of their working day. This follows a similar pattern that is undertaken in zoos and aquariums were animals perform for the public.	With the training of some animals, the maintaining of a training weight is important, one example is that of training of birds of prey, i.e. flying weight. ; However, starvation of any animal even in initial training is cruel and unnecessary. When in good health, sea lions have very good appetites and this can easily exceed their daily allowance of food that would maintain them in a

Expert	Training			
	3.14.How many acts per day	3.15.Until what age can they perform	3.16.How much food during performance	3.17.How much starvation is practiced before training
	cues before they are given. ; Show routines can be varied but the length of performance is limited and therefore monotony is unlikely. Many circus animals are displayed outside their performance time in their quarters and this includes the sea lions.	However, Dr Dan Odell who is a research scientist with Hubbs-Sea World (who studied sea lions and elephant seals on San Nicholas Island, in southern California for his 1972 thesis) [(Odell, 1972)] calculated that sea lions live 17-18 years with males living less long than the overall average and females living longer than the overall average (Odell, Personal Communication). ; I am aware of a female California sea lion I worked with at the Welsh Mountain Zoo who died at the age of 36 years and a male at Chessington World of Adventures who was 26 years old at the time of his death. Both animals remain active until their deaths although both began to show signs of failing vision; this is also common in old wild sea lions (Peterson and Bartholomew, 1967). However, the ages for these two cited captive animals should be considered maxima. ; More recent research by Innes et al. (2005) in the USA demonstrates that captive marine mammals (such as California sea lions) live significantly longer than their wild counterparts (Innes et al., 2005). ; Since the introduction of the Marine Mammal Protection Act (MMPA) in 1972, all births, deaths and acquisition of		healthy and fit state.

Expert	Training			
	3.14.How many acts per day	3.15.Until what age can they perform	3.16.How much food during performance	3.17.How much starvation is practiced before training
		marine mammals in the USA have to be reported to the US government. Therefore this data is very robust, this data would include circus animals.; http://www.nmfs.noaa.gov/pr/permits/public_display.htm		
E & F	We doubt that in a circus animals may perform for too long as most performances are only 30 minutes max for up to 4 times daily. Most animals will easily enjoy such a schedule. Again, it is important for the trainer to monitor the reactions of the animal and see if the animal experiences the training performances as positive. This also goes for variability/monotony.	Some animals can perform until they die at a high age. We have no information on the average/maximum life span of sea lions in circuses. This will be gender and species dependent.	Depends on the schedule of performances, training sessions and free play feed. Some animals do not require a food reward during performances. For them attention is a good enough reward.	No starvation should be used for any training purposes.
G	Depends on duration, intensity of behaviours, and frequency of behaviours. Professional trainers have flexible shows with variation in frequency / repetition. See above.	Until they are physically and psychologically fit, again can depend on many factors.	Depends on individual, species, life stage, performance intensity	No starvation should be practiced, but often is, sometimes spanning the whole season animals are kept on a low body weight to ensure performance. Not acceptable to me.

Expert	Guidelines & transparency		
	3.18.Do the housing conditions meet existing guidelines	**3.19.Which guidelines exist and how are they enforced**	**3.20.How transparent are various welfare requirements; how to guarantee**
A	No idea what the guidelines are.	No idea.	Yes, housing can easily be checked. The other welfare parameters (food, attention, training method, veterinary care) will most probably be OK, as these animals are very valuable to the trainers, and the trainers will have a strong bond with their animals.
B	???	Guidelines for European zoos: sea lions should be able to dive at least as deep as twice the length of the largest animal (and that is impossible in the circus).	
C	Yes (pool 60k litre); most tourists travelling with sea lions have good facilities nowadays; one family in DK has even a huge winter pool (500k litres).	Individual countries have varied guidelines. Generally, we follow DE, FR guidelines which exceed the guidelines in other countries. Guidelines are enforced through licensing/competence tests/facility approval in FR, random inspections in DE, SE, DK, BE, FI by state vets.	I have observation camera's to show if animals are not disturbed or stressed during travel;
D	See 3.18	I would suspect that the majority of travelling circus sea lions exhibited in mainland Europe (EU) would comply with the US Specifications for the Humane Handling Care Treatment, and Transportation of Marine Mammals [(USDA, 1979)]. ; Many European countries (such as Germany and France) have specific legally binding regulations (not guidelines) for the welfare of circus animals including sea lions. Clearly, when sea lion acts wish to perform in these countries they would have to comply with these standards.; The UK introduced welfare regulations for wild animals in circuses in 2012, this included inspection and licensing. These can be found linked below. Specific regulations for sea lions can be found on page 54 (DEFRA, 2012b).	As stated elsewhere, many countries have legally binding requirements for both zoo and circus animal welfare. These tend to be in the form of licensing which requires periodic inspection by persons who are experienced in matters of animal welfare (generally government appointed). Licensing is only granted when welfare standards have been met. Failure to operate without a license is legally sanctioned by fines or even to animals being removed.
E & F	What are the housing conditions? We	We conform to the Zoo directive.	Welfare may be measured by health, physical condition,

Expert	Guidelines & transparency		
	3.18.Do the housing conditions meet existing guidelines	**3.19.Which guidelines exist and how are they enforced**	**3.20.How transparent are various welfare requirements; how to guarantee**
	have little knowledge on the housing conditions in circuses.		behaviour and hormonal studies. Behaviour may indicate undesired emotions and desired emotions. Both should be taken into account.
G	As far as I am aware there are no existing guidelines.	EAAM (www.eaam.org) is working on guidelines, but they are not ready	I would say with regards to space to swim and locomote very transparent, easy to see how much is there. Water and food quality can also be assessed easily. Social impact too. Stunned growth due to small environment could be looked for, and anxieties due to negative training methods are sometimes harder to assess, as anxiety can result due to hunger or other factors.

Expert	Comparisons with other animals and circumstances		
	3.21.How is welfare compared to other animals in circuses	**3.22.How is welfare compared tosealions kept in zoo's, or in the wild and in human habitats**	**3.23.What is the economic profitability of the circus**
A	Similar, but water is an issue and food (good quality fish) needs extra attention.	The lack of a proper saltwater pool is the main difference, and the chance to avoid/reduce negative social interactions. A positive item of circuses is that they train the animals, so that they have many interactions per day, which prevents boredom which often occurs in those zoos that have no performances for the public.	Sea lions are also top predators such a lions and tigers. They are impressive, strong and very agile.
B			
C	There are less issues with keeping and training sea-lions as well as the issue of public safety; sea-lions are not as aggressive/dangerous as elephants, tigers and lions.	Compared to zoos/Dolfinaria: Circus sea lions are exposed less to the public, have a more stable relation with trainer/owners. Possibly more stimulation (new sights/smells/environments). Less problems with chlorinated water. More travelling. Compared to the wild: No predators/hunting/culling/pollution. Possibly extended lifetime in the circus due to human care.	Every well run Circus prioritises animal care over finances. Nowadays, all sea lions (apart from one act in DK) are owned by individual trainer/owners, so the responsibility to generate revenues is their responsibility.
D	I can find no evidence that sea lions received care that is of a lower standard than other circus	There is no evidence to suggest that the welfare of sea lions kept in circuses should be different to that of sea lions kept in	Circuses with animals both in mainland Europe and the USA appear to be popular

	animals. As pointed out, many countries do now have welfare standards legislation for circuses animals.	zoos and marine parks.; Despite national protection of sea lions in the wild (US Marine Mammal Protection Act) they appear to have a lower survivorship than captive animals (Innes et al., 2005). These animals are susceptible to net entanglement and other hazards. They have also been hunted and killed in the past as pest species in competition with fisheries.; There has recently been research done on too high levels (20%) of cancers (metastatic carcinomas) in stranded California sea lions. Research is on-going.; http://www.smru.st-andrews.ac.uk/slicc/background.html[e.g. (Gulland et al., 1996; Lipscomb et al., 2000; Acevedo-Whitehouse et al., 2003; Bowen et al., 2005; Buckles et al., 2006; Buckles et al., 2007)]	and sea lion acts have always been a popular circus attraction. It is unlikely at this current time that this situation will change. ; It should be noted that sea lion acts (like a number of other animal acts) are now not owned by circuses but are hired in from private animal trainers.
E & F	We don't know due to lack of knowledge about circuses.	We don't know either, because of lack of knowledge on welfare of sea lions in circuses.	Do not know.
G	To be honest I do not know. I have not seen them in circuses for a long time, must have been the last time in Denmark 14 years ago where the owner took the sea lion swimming in the fjord!	See above. But knowing what the conditions are likely to be like I would say their welfare will be worse (although space is certainly not the only important parameter! Perhaps social conditions are more important. A preference test could help to determine these criteria - if many sea lions are used something can potentially be said about this in the future. It is also hard to say something with regards to the species. This survey is about sea lions but the different species have different requirements, which will have to be taken into consideration in more detail.	I know some travelling circuses make enough money in the summer with shows, photos etc. to close or travel less in the winter, so I expect the profitability must be fairly high, as winter also costs money in care, water, fish, etc.

Expert	Evolutionary history	
	4.1.Environment of evolutionary adaptation	4.2.Early / previous life experiences
A	Sea lions are never domesticated!	When born in captivity, the animals have no idea how the wild would be.
B		
C	No inbreeding. Facility contains many features similar to the natural habitat; water, dry area, steps instead of beach and rocks.	Probably (almost) all sea lions used in European circuses (excl. Russia) have been born in captivity (no wild caught animals since about 20 years); weaning at about 1 year of age, by natural rejection by the mother and introduction of fish - first freezing small pieces of fish into ice-cubes, then slightly frozen fish, progressing to small fish (Capelin). Early training consists of contact/"trust" sessions developing into "play" sessions. They easily adapt to new environments.
D	Welfare Issue: Little or None; Currently sea lions are believed to have shared some common evolutionary history with bears and they are among a number of terrestrial animals that evolved back into an semi-aquatic lifestyle.; These animals have shown a remarkable level of adaptability and, whilst not having been domesticated, have taken advantage of coastal human habitation and interaction. ; The California sea lion has been displayed in zoos and circuses since the early 1900s, with its ease of taming and general robustness to adapt to various captive environments being a key issue in its success and popularity with the public.	Welfare Issue: Little or None
E & F	The measure of coping with the artificial environment should be evaluated based on behavioural studies, health and reproductive criteria. In general, sea lions adapt well to an environment under human care in zoos and aquaria. Again, as we have little knowledge about circuses we do not dare to pass a judgment on them.	We have both dealt with captive born and wild caught animals and have noticed little difference.
G	Sea lion species dependent. High level of discrepancy. Inbreeding possible, depending on whether they monitor breeding, exchange animals with other circuses. Not domesticated but highly adaptable and trainable - is often viewed as being in their favour, but it might not be. Welfare is not only about coping, but beyond and includes also positive welfare states.	Born in captivity from a captive mother is perhaps better than removing them before weaning from the mother in the wild. More research is needed on this. Weaning of captive-born individuals is usually done slowly over time and in a playful manner. The animals are habituated to eat dead fish. - Training should start as soon as an animal is born. Animals even learn before birth. Harsh training methods or severe food restriction can stunt growth, or induce fear and anxiety. This is why

Expert	Evolutionary history	
	4.1.Environment of evolutionary adaptation	4.2.Early / previous life experiences
		we often see hyperactive sea lions, which are very lean.

Expert	Daily and seasonal variation		
	4.3.Summer vs winter environment	4.4.Daily activities: circus act, training, local movements	4.5.Transport from place to place
A	Winter is better, as one of the possible problems in captivity is overheating due to lack of water.	They can be trained as soon as they shift from mother milk to solid food (fish). Social interactions are useful to prevent boredom resulting in aggression and sterotypical behaviour.	Not so good, but when they are used to it, it is less problematic
B	Be aware of the pupping (June – July) and the mating season (July – august)		
C	The same, with exceptions; During winter: heating in sleeping area. Possible heat pump to prevent outside pool from freezing at night. At extreme cold (-10 C): facilities are moved to a rented hall and facility are built indoors. Sea lions increase blood circulation by swimming, which raises the body temperature.	Mornings: cleaning the sleeping area, filling the indoor pool, 1st feed. Possibly training if there is no early show. Walk to outside facility. Possibly 1st show in the afternoon/second feed. PVC mats are laid from the pool to the circus for protection from objects on the floor. Return to the outside facility. Possibly 2nd show/3rd feed in the early evening. Return to outside facility. Approx. 9 pm return to the inside pool, final feed, draining of the pool, sleeping.	Transport occurs in the early morning when the sea lions are sleeping. Cameras are used to survey the animals during transport. The sea lions sleep together and are rarely disturbed during transport. The inside pool is used (provided with some water) for long journeys.
D	Welfare Issue: Little or None	Welfare Issue: Little or None	Welfare Issue: See 3.10
E & F	No influence of season noted on the species we deal with.	No specific welfare issues noted in our experience	Temperature control is very important (should not be too hot). Proper acclimatisation if placed in a new social group is necessary. Careful management or introductions.
G	Need for cooling opportunities when hot (body / flipper cooling in water, heat release through flipper dipping and lifting). Shielded from extreme cold, ice and snow.	Physical and cognitive stimulation is a necessity. Rest at night, or naps during the day.	Safe and soft environment, impact resistant, window for view and some external input.

Expert	Special circumstances	
	4.6.e.g. breeding season, unit for travel, due to pregnancy or illness	***4.7.What happens to an animal that cannot cope/ perform well enough***
A	Adult males are more aggressive in the breeding season, towards both man and conspecific males. Travel during advanced pregnancy is undesirable.	I have no idea if this occurs, and if circuses have an exit plan for such cases. Zoos also have this problem (often with males).
B		
C	Breeding season often means that male sea lions refuse to perform. No attempt is made to force them. Pregnant females are not transported for 3-4 weeks before the expected moment of birth. No ill animal are transported without first consulting a vet/specialist.	That is accepted. Sea lions have "off" days, where they don't perform well. Mostly before the mating period (summer). There is (has been) no pressure from a circus on me to make animal perform/perform better.
D	Welfare Issue: See 3.9	Most animals displayed have been performing for many years and new recruits will be via captive breeding. It seems unlikely that they cannot cope. ; Animals do have days when their performance may not be up to a certain standard but this is also true for humans.; I would suspect that if newly introduced animals were of a dispersion that they were not suitable for circus performance they would be retired to a zoological collection. I am aware of one instance of this occurring recently but this was with a tiger in a circus in Japan; it was retired to a zoo.; Most pressure for animals being removed from circuses are concerns and campaigns from members of the animal-rights community that may well not be due to welfare but political dogma.
E & F	If an animal is unfit to travel, it should not be transported. Highly pregnant animals should not be transported either in our experience. But the latter does depend on transport conditions and habituation of the animal to transports. If well habituated and in good conditions transport of pregnant animals may safely occur.	An animal may show negative behaviours if it cannot cope adequately. Behaviours like shaking with the head, waving big eyes and anxiousness should be carefully observed, analysed and interpreted to evaluate as useful coping criteria indicators.
G	Any animal that is ill needs medical attention and might not be fit for travel. Strenuous travel is not suitable for pregnant animals and those awaiting / needing medical attention.	Sold on or killed, I suspect.

Expert	5.1.Climatic factors
A	Cool environment, saltwater pool.
B	
C	No chlorine in the inside pool, minimal usage in the outside pool. Pools are preferably drained, cleaned and refilled. Seawater can be pumped in if close to the shore, otherwise potable water is used. Sea lions adapt to noises/lights/music by gradual training sessions in the tent.
D	Environmental issues such as air-quality do not seem to be an issue for sea lions in urban zoos, so it is unlikely this would also be an issue in circuses.; Sea lions in circuses tend to spend their daylight hours outside in natural daylight. ; Water quality can be addressed by water treatment technology or water replacement. ; Also see: 3.7 regarding water quality. - [As to 'house training' to keep the water clean:] Sea lions' faeces tends break up in water; sand filtration will physically remove this. Obviously, you do not want a build-up of an organic load in the water (with possible pathogens) but these can be removed by either chlorination* (which will also act as an organic oxidiser), ozone, ultraviolet sterilization or dilution via water changes. - For background: ; (Dineley, 1998). - * Chlorination is a complex process and really needs to be undertaken by someone that understands the management of such systems. I suspect ozone, ultraviolet sterilization and/or simple dilution via water changes would give sea lions adequate and hygienic swimming water. - The US government has standards of water quality that are useful guideline Section 3.106 Water quality, page 104. This document was also linked in my original submission [(USDA, 1979)]
E & F	Sea lions may get overheated if no access to water is available and the air temperature is high. Otherwise they should be kept in the same conditions as humans. Sensitivity to noise and other stimuli should be closely monitored if such stimuli occur. Aversive or anxious behaviour indicates conditions which are not proper. In general, sea lions are not more sensitive to stimuli then humans. There is of course species and individual variation.
G	Eye problems have been reported in sea lions, too much glare, not enough shade, chlorine, and housing in fresh water. I could not find any research on noise and/or air quality in captive sea lions.

Expert	Food and drinking water	
	5.2.Food, nutritional quality, regularity of feeding	*5.3.Quality and quantity of drinking water*
A	Good quality fish (thawed frozen fish) is very important. The trainers will surely take care that a sufficient amount of food is given as the animals are very valuable to them.	No need, they get all their water from the fish (between cells and by metabolism).
B	Never restrict food for training. only first quality of fish should be used. Storage and defrosting is very important (Crissey and Spencer, 1998)	No water needed if fish is of sufficient quality but in stress or during fasting animals might sometimes want to drink
C	Fish imported from Parlevliet NL (Supplier to NL zoos), transported all over Europe. Capelin and Herring are used (50% each). Males eat 7kg and 3kg respectively, females 6kg. Winter increases food consumption. Feed takes approx. 10 min. Possible that the adult male is "snapping" at our young male as an expression of food dominance.	Fluid is taken from consuming fish.
D	Sea lions require high quality food. Due to modern fishing methods and freezer technology these can be satisfactorily supplied by circus trainers. ; Animals tend to be fed individually and due to the animals being trained to 'station' this should ensure no (or very) limited feeding-related aggression.	Sea lions receive their metabolic water primarily from their food, as do other marine mammals such as dolphins. There is some evidence that these animals will ingest seawater from their environment (Ridgway, 1972). ; Only on one occasion have I witnessed a Patagonian sea lion drinking from its pool at Blackpool Zoo in 1973. I have not observed this behaviour in the many other sea lions I have cared for. I would consider providing drinking water to sea lions would be unnecessary provided they are well fed and have periodic access to swimming water.
E & F	The amount of food provided should keep the animals in a proper body condition (not obese, not skinny). Food deprivation for training purposes is out of the question. Food should be of an excellent quality and food processing should guarantee this. Manuals on preparing fish or marine mammals are available. Supplements (vitamins and salt) may be provided based on the species-specific necessities (can be found in for example Marine Mammal Medicine (Dierauf and Gulland, 2010).	Sea lions normally do not drink water but obtain their water from the food provided and from burning fat.
G	Food should be calculated to suit the individual's nutritional needs. Food is necessary for water intake too, especially when housed in salt water. Higher anxiety due to hunger and/or unpredictability, or quantity and long deprivations between feeding. Sometimes kept on a single species diet, which could cause problems. Fish should be cool air thawed (not water thawed). Males can experience more food control in the mating season, and or be overfed to reduce aggression.	Sea lions do not usually drink sea water, but will drink fresh water. Quality nutrition is important.; Water intake (Kenney, Unknown date).

Expert	5.4.Thermoregulation
A	Main problem: overheating. This can be avoided by allowing them to swim, create shade or cool the environment in which they are kept.
B	Transport may easily lead to overheating (we use an open cage to transport sea lions).
C	In extreme heat, a tent is erected over the dry resting area to provide shade. A heater (with infrared lamps) is used during the winter.
D	Thermal regulation in sea lions is important. The animals cannot control excessive heat exposure by sweating or panting. Good ventilation, access to shade and or swimming water are important in warm and hot weather. Well-fed sea lions with good body condition appear not to be effected by cold weather. I have cared for a group of sea lions in a UK zoo that would be exposed to frozen weather conditions, including ice on their pools. They appeared to suffer no ill effects. An interesting observation was that they spent more time in the water no doubt due to the heat-sink effect of the water whose temperature remains reasonable stable.
E & F	Animals should have access to water. This is especially important if it is hot as hyperthermia can be a real risk when hot without water access.
G	Shade yes, and see above.

Expert	5.5.Rest
A	The floor can be rough and wet, as this is what they encounter in the wild. However, one should make sure no chemicals from a top layer coating irritate the skin.
B	
C	The sea lions sleep out of the water during the night (10 pm till 10 am is the normal resting period)
D	Welfare Issue: Little or none if following regulations suggested in 5.6
E & F	Sea lions generally can rest on stone (they do rest on rocks and pebbled beaches. However, they do like wooden boarding which is more comfortable. Sand can be used as well.
G	Different substrates for tactile experience and comfort. Most sea lions like socializing but space should be available to move away from each other, also out of visual sight. Areas should be dry, have opportunities to sun bathe, have good drainage and good water turnover.

Expert	Movements	
	5.6.Kinesis (locomotion, swimming) pool size	*5.8.Migration*
A	All mammals need rest. Normal after a day's work, sea lions tend to sleep a lot.	Some populations in the wild migrate, others don't.
B	Circus pools provide inadequate depth (<2m, while should be >2 times the length of the largest animal); sea lions are very active animals: they need lots of space.	
C	They swim from approx. 9am to 9pm, swimming patterns vary (film provided), they climb in and out of the pools, walk on land with ease, we have 3 pools; 10.25x5.1x1.2m (l*w*h), 6.5x3.2x1m, 5.5x2.5x1.3m (indoor).	
D	Basic US parameters for accommodation can be found linked below [(USDA, 1979)]. There are also specific regulations in Germany (BMELV, 2005), France and other European counties for sea lions in circuses. Hopefully you have been sent these. If not, it might be worth contacting these governments' appropriate departments or the European Circus Association. ; (USDA, 1979)	The need to migrate does not seem to be a welfare need for sea lions.
E & F	Sea lions should be able to swim freely and have enough room for normal social interaction including the opportunity to take distance	?

Expert	Movements	
	5.6.Kinesis (locomotion, swimming) pool size	*5.8.Migration*
	from companions if they so wish (e.g. in case of aggression). Pool sizes should be such that positive behaviour and social interactions are supported by the pool size. Unfortunately, no hard data are available per species to prescribe necessary pool sizes. This is an area for future research also in zoos and aquaria.	
G	Ensuring physical fitness, through environment (and or training). To properly swim you need space, a good pool size in relation to species. Too often sea lions (and other aquatic animals) are housed in too small pools for allowing a full range of motions.	

Expert	5.9.Body care
A	No special care if the environment is OK (see above).
B	
C	Often sunbathe
D	Sea lions (unlike some species of seal) do not have dramatic periodic moults - this appears not to be a welfare issue for these animals.
E & F	Water quality is important and should conform to standards generally valid in zoos. Ample documentation is available on this topic (see for example Dierauf and Gulland (2010).
G	Sometimes moulting problems, disease, flooring, hygiene

Expert	5.10.Social contact
A	There is the need to keep the animal in groups (at least 2 animals together), as this is a social species which lays in groups on haul-out sites in the wild.; It is best if the pups stay with their mothers as long as they suckle. After that they can be separated. Social composition: see above. At least 2, not 2 male adults together, unless they are castrated.
B	
C	Stable social relationships since birth; I now have a female (20 years) and 2 pups (2 of 4 years of age), all Patagonian sea lions.
D	See 3.9
E & F	Sea lions are social animals. You must keep them in groups of at least two animals. When the mother gives birth, the pup will stay at least one or two years with the mother. This depends on whether the mother is giving birth to another pup.
G	The social structure is important, e.g. in play, sleeping together and social support. Includes the need for an opportunity to hide or move away.

Expert	Exploration			
	5.7.Play (locomotor and object)	***5.11.Investigation, wandering, object manipulation***	***5.12.Foraging, hunting, working for food (performance/training)***	***5.13.General stimulation level; time budget i.r.t. natural time budget***
A	Sea lions do not play much with toys. It is better to have sufficient social interactions with conspecifics and with their caretakers.	No need for enrichment with toys, as long as the pool is big enough and they are trained.	That is what is good about training. They have to work for food just like in the wild (do an effort to get the food)	A great need for social interactions and training and a way to burn energy during swimming.
B	enrichment should be provided			Training can be positive for sea lion welfare, but circus performance (e.g. twice per day plus 4 training sessions) is inadequate to provide stimulation; they need to be able to swim a lot (space needed) and preferably hunt for food. Same performance every day is boring for sea lions.; Stereotypies are difficult to observe in sea lions, they only swim a lot;; Travelling is not enriching for circus sea lions (too much routine).
C	The often play with each other, play fighting, chasing, playing with bubbles, non-destructible objects, balls, hoops.	New sights, smells upon arrival at a new venue; incidentally we allow supervised swimming in the open sea where permitted;	Challenge of performance replaces challenge of hunting.	Varied daily routine, varied training, socialisation with each other and trainers, no circle swimming, often fish are thrown to stimulate a "race" to get fish, no stereotypies noted.
D	See 3.4	See 3.4	Foraging behaviour does not seem to be welfare need. Performing animals such as sea lions work for a part of the daily allowance of food. ; Over feeding sea lions would be a welfare problem if it caused obesity but this seems unlikely if they are placed on a controlled and suitable diet.	See 6.10
E & F	The social group provides enrichment of the environment but multiple toys and food	Enrichment is important, especially if the environment provides few stimuli, e.g. in	When there is a good relationship with the trainer, it is possible to do a show/ training with little or even	Little stereotypic behaviour has been documented, but research done is also pretty limited on these species. We do see at times

Expert	Exploration			
	5.7.Play (locomotor and object)	*5.11.Investigation, wandering, object manipulation*	*5.12.Foraging, hunting, working for food (performance/training)*	*5.13.General stimulation level; time budget i.r.t. natural time budget*
	containers can be used as well to give the animals opportunity to investigate, be challenged and play.	socially poor environments. The need for enrichment can be determined form the eagerness in which animals take up the challenge provided by enrichment. Little research has been done on ethograms of sea lions. Here is a research need to come to a good evaluation and proper management.	without fish. This is only possible when they work with a positive training schedule. Training provides excellent enrichment and we have noticed in our collections that negative aggressive behaviour which appeared in our Steller sea lions when not trained (decades ago training was minimized in winter times) disappeared as soon as training and performances where restarted. So training performance makes good enrichment and substitutes the daily challenges these animals find comfortable.	head shaking and weaving in sporadic individuals.
G	Enrichment is important!	Varied and unpredictable enrichment schedules, covering 5 categories, attached in email. [See (Anon., 2011)]	Part of the food should be freely accessible, i.e. not contingent upon showing correct behaviour / training sessions.	Boredom is more prevalent, swimming or locomotory stereotypies, regurgitation, flipper aiding in regurgitation, heightened aggression. Natural time budgets are not met, also not in zoos.

Expert	Reproduction		
	5.14.Sexual behaviour	*5.15.Territorialism*	*5.16.Maternal behaviour*
A	Adult males are often castrated in zoos to prevent aggression. This is also a birth control method to prevent more animals and prevent in-breeding.	Male sea lions are territorial, during the breeding season. Unless castrated, this is a problem when living in a moving circus.	When the separation is short (such as separation for a show) there is no problem, as mothers in the wild leave their pups when they go out to sea for foraging. During the suckling period, it is best to keep the mothers and pups together most of the day.
B		Not suited for shows/training during the breeding season;	
C	Mating period occurs in summer, Males often ruttish. Separation possibilities exist during this period.	Territorialism is mostly observed during the mating period. Sea lions mostly don't perform if displaying possessive traits towards females. Distance is kept until such a period subsides.	The mother is protective, not performing for 1 month, then separated for performance, unfit for travel about two weeks before birth.
D	I am not aware of contraception being used in captive sea lions. ; In extreme cases of aggression directed at females during the breeding season, some zoo veterinarians will prescribe anti-androgens. This is not a problem if females with pups can be separated from males in the initial period after birth. ; Due to the success of breeding and mother rearing of sea lions in a circus environment this appears not to be a major welfare problem.	Males in rut do not appear to target humans but other males. ; Also see: 5.16	Female sea lions can remain with mature males and other group members until partition. A period of separation for mother and pup may be necessary to allow bonding after birth and to avoid sexual attention from the male. ; California sea lions will come into oestrous within 10 days after birth. The breeding season for California sea lions is June and July. Patagonian sea lions are from the Southern Hemisphere and breed during the European winter. There is evidence to suggest this moves when these animals are housed in the Northern Hemisphere.
E & F	Most sea lions reproduce if given the opportunity. Birth control measures (chemical and surgical) are well established.	Depends on the species.	If an animal is unfit to travel, it should not be transported. Highly pregnant animals should not be transported either in our experience. But the latter does depend on transport conditions and habituation of the animal to transports. If well habituated and in good conditions transport of pregnant animals may safely occur. How well temporary separation is tolerated by the animals is dependent upon species and

Expert	Reproduction		
	5.14.Sexual behaviour	*5.15.Territorialism*	*5.16.Maternal behaviour*
			individuals, and should be monitored by observing behaviour. In general, we do not separate mother and sibling until one or two years old. Siblings can happily accompany the mother during training and performances.
G	Some animals are/may be often / always on birth control so pregnancy does not disturb the show routine. Aggression during mating season, protection of pups. Death or injury due to mating season. Get away areas for small females and pups from adult males.		Too early weaning, no other sea lions to learn appropriate behaviours and communication.

Expert	Safety	
	5.17.Safety from conspecifics (aggression/escapes)	*5.18.Safety from external stimuli*
A	No problem, as during training food is given individually.	Trainings methods using physical punishment should be prevented. Veterinary care should be optimal (by a specialized marine mammal veterinarian).
B		Training can be useful to reduce stress (e.g. medical treatment);; travelling is probably less stressful for circus sea lions than other sea lions due to habituation, but this does not imply a better life.
C	No aggression when obtaining food. Sea lions can escape/separate to the second pool or to the dry resting area during social threats.	Training sessions reinforce the bond between the animal and the trainer, which results in the sea lion "trusting" the trainer, which is useful when nursing young pups, or treating the sea lion with medication.; Observation camera's show that the animals are not disturbed or stressed during travel; no fixation is required during transport (as e.g. needed for horses, because sea lions have broad flippers and little chance of slipping or falling during transport).
D	Most circus sea lion set-ups have the ability to separate animals as witnessed by their success in breeding animals when 'on-the-road'.	I suspect that none of these things would be a problem for a habituated animal. ; Physical punishment of animals should never be used but as stated elsewhere sea lions are easily trained using reward and positive reinforcement. ; The training of medical and husbandry behaviour (veterinary examination, etc.) are reasonably straight forward to train and should be encouraged.
E & F	When a sea lion shows aggression there is always a reason. Only when the animal did not have a good socialisation when he/ she	When you use a negative way of training, the animals may show aggressive behaviour during the performance. This is because there is no positive relation between animal and

Expert	Safety	
	5.17.Safety from conspecifics (aggression / escapes)	*5.18.Safety from external stimuli*
	was pup, she can show aggressive behaviours. Also, when you give too small quantity of fish, this is a stimulus to show aggressive behaviour.	trainer.
G	Females have been killed by males during mating. Space to move / get away.	Weather, excessive noise, public harassment

Expert	Health and injuries	
	5.19.Health and hygiene	*5.20.Injuries, pain*
A	See above.	An electric wire can be used to keep sea lions in a certain area. They learn very quickly and will get a shock only once in their lives.; Castration of males often occurs in zoos to prevent aggressions of adult males amongst each other.
B		Handstand, walking on hind flippers and sitting on chairs on hind flippers resulted in very warm lower backs: probably hips and spine is not suited for such unnatural 'tricks'.
C	There are no problems in keeping sea lions healthy in a circus environment	Deep pools (e.g. 2m) is a risk when the sea lions have to jump out of the pool for 2m to get to the resting area (big males can be up to 400 kg and injure themselves). Now my pool is 1.2m high, which is ok.
D	I cannot see problems being serious issues of welfare any more than that for other wild animals in the circus. Most circus sea lion trainers have a 'home base' that animals could be removed to in time of serious illness. Nevertheless, in most cases these can be treated in situ. I have referred to water treatment elsewhere (3.7) but water changing is straight forward if the filter systems seem not to be able to cope (diarrhoea).	I am not aware of any surgical procedure that is undertaken on sea lions that would be classed as 'mutilation'. Male sea lions are sometimes castrated if they are housed in male groups and are deemed surplus for breeding purposes. ; Shock collars and beating should be illegal; I am not aware of these ever having been used by responsible trainers of sea lions.; As said, sea lions are very robust animals and I have seen very little serious injury to them even when involved in aggression which tends to be short-lived. Possible aggression from males towards cycling females is the only time I have seen prolonged 'harassment' of females. However, generally this can be resolved by temporary separation. ; The sea lion reproductive cycle is only exhibited for several weeks once a year, so I do not see this as a long-standing welfare issue that cannot be resolved by undertaking the simple steps outlined above.
E & F	Water quality should be good, especially when disinfectants are used (i.e. chlorine). Concentrations of disinfectants need to be monitored carefully. In general, sea lions are healthy animals. In case of disease veterinary care is necessary, preferably by a vet with some background knowledge on marine mammals.	In general, few injuries occur. Occasional bite wounds may occur as part of social interaction (not always necessarily negative, sometimes part of "natural" social interaction). Eyes are sensitive especially in older animals. Eye problems have a multifactorial aetiology which involves water quality and UV exposure.
G	Water, dirt, uneaten fish,	Over exercise, demanding program, physical punishment

Expert	5.21. Conflicts of interest
A	Shock collars should not be allowed. It shows that the trainer is not capable enough to train his animal.
B	
C	I have never been "forced" to perform during periods where an animal is reluctant (mating period mostly). Animals are never transported if sick, unless under vet. advice. Income is sufficient for all necessary facilities.
D	As mentioned, many countries do have legal standards for sea lions in circuses and elsewhere. Sensible application of these would ensure welfare standards are maintained and not overridden by commercial considerations.
E & F	For water quality sufficient documentation is available. We are not knowledgeable enough on the situation in circuses to give any judgement on their functioning.
G	

Expert	6.1.Natural behaviour
A	Great need to swim
B	Circus cannot provide amounts of swimming opportunities which they do in nature;
C	OK in the circus: can sleep, sunbathe, feed, swim, play, mate, reproduce – as well as enjoy the stimulation and challenges provided by training and close personal contact with those who have lived with them since birth
D	The success of both survivorship and reproduction in a circus environment suggest these animals' natural tendencies are met in circuses.
E & F	Social needs are very important. A proper social context in which there is opportunity for affiliative behaviour and good social relationships is most important for sea lions given their social nature in the wild. These animals also have a high need to be in the water and swim. They should have sufficient opportunity to be in the water. They are hunters and therefore like challenges. This can be accommodated for by training and participation in performances.
G	

Expert	Preferences and demand	
	6.2.Preferences	*6.3.(Consumer) demand*
A	Big enough pool	??
B		
C	Prefer to sunbathe on land, and cool down/play in water during hot weather, more time is spent in the water during cold weather.	
D	?	?
E & F	We do not know to what extent animals can be social and in the water in circuses. We assume enough training is given to the animals.	See above
G		

Expert	(Re)productive performance, survival and fitness		
	6.4.(Re)productive performance	*6.5.Survival, longevity*	*6.6.Fitness*
A	Not important if you keep the animals their entire lives in captivity (as is usually the case)	Most sea lions in captivity reach the same age as their wild conspecifics.	??
B			
C	Sea lions reproduce in the circus environment; we have had 2 pups in the last 4 years;	Approx. 30 years; no infant deaths in 25 years, no sea lion has been transferred/sold due to	They thrive in captivity;

Expert	(Re)productive performance, survival and fitness		
	6.4.(Re)productive performance	*6.5.Survival, longevity*	*6.6.Fitness*
		selection pressure for performance.	
D	YES	YES	YES
E & F	When these animals reproduce, it is important that that proper mother pup bonding can occur and the mother has the opportunity to take care of her sibling.	We have no data on circus animals. In zoos animals outlive their wild counterparts by many years and pup survival and raising is good as can be derived from the necessity to use anticonception to prevent overpopulation.	These animals appear to cope very well under human care in zoos.
G			

Expert	Stress and arousal	
	6.7.Stress	*6.8.Arousal*
A	A well trained and housed animal will not show increased stress hormones.	A well trained and housed animal will not show increased stress signs.
B		
C	I spot signs of a stressed sea lion; they are then scanning the environment with a stretched neck, ignoring. The passage back to the pool is always kept clear, and close by.	
D	YES	YES
E & F	There is no indication that sea lions suffer from chronic stress under human care. However, social conflict may occur and if an animal has an unpleasant social position, this should be managed carefully and appropriately.	See above
G		

3.6.5	Aggression and abnormal behaviour (stereotypies)	
Expert	*6.9. Aggressive behaviour*	*6.10.Abnormal behaviour*
A	Aggression is always possible. They are wild predator animals.	These occur when the housing and interactions are not sufficient.
B		
C	During rutting the males may be aggressive (the big ones will stay in the pool and fight).	Our sea lions do not show stereotypies.
D	See 5.20	YES. However, this must be qualified. The context is important. Animals may display what is considered a stereotypies when in fact it maybe expectation behavior, e.g. waiting to perform.
E & F	Aggression may occur due to a lack of socialization (much like in dogs) or if inappropriate training methods are used. The social situation in which animals are kept may increase aggressive behavior as well. Aggression can be decreased by using appropriate training methods (again much like in dogs). Individual and species	Well reading of the body language of the animal and sufficient enrichment can prevent abnormal behavior.

3.6.5	Aggression and abnormal behaviour (stereotypies)	
Expert	***6.9. Aggressive behaviour***	***6.10.Abnormal behaviour***
	variation occurs. In general aggression towards humans is exceptional	
G		

Expert	6.11.Frustration
A	Always possible.
B	
C	
D	?
E & F	The trainer needs to read the body language of the sea lion; frustration and avoidance behaviour can be reduced.
G	

Expert	Sickness and pain	
	6.12.Sickness	***6.13.Injuries, trauma, pain***
A	Possible, see above. Mainly due to adult males, poor housing and lack of social interactions.	Need proper veterinary care.
B		
C	No chlorine used meaning no eye problems. Rare puncture wounds from play fighting/rutting. [Additional note on eye problems:] in my experience sea lions can have redness (blood vessels) around the pupil without there being a problem. As long as the pupil is black, there is no suggestion of over chlorination of the water. Normally, if a sea lion has a problem, or is experiencing discomfort/pain, then it will either squint or completely close the eye. A sea lion having bluish eyes is normally a sign of poor water quality/over chlorination.	
D	Animals can become sick and this may not be the result of bad welfare. Sea lions when cared for appropriately tend to be very resilient to illness. In many circuses sea lion trainers do have access to specialist veterinarians who can advise them.	
E & F	In general sea lions are healthy and sturdy animals that live very long lives in zoos.	Veterinarian needed
G		

Annex 4 Responses of Sea Lion experts (restricted questionnaire)

Expert	Welfare priorities	Welfare requirements	Welfare score and range
1	1: Pool space; sea lions need lots of swimming opportunities (essential requirement). 2: Adequate filtration system and good water quality (essential requirement) 3: Cataract in sea lions. Sea lions often have eye problems (infections, esp. of the cornea) due to inadequate feeding and poor water quality. [Other welfare concerns: sea lions may get too cold, e.g. during transport, which may lead to pneumonia. Sea lions originate from warmer climates and not infrequently have insufficient swimming and feeding opportunities in the circus. During travel sea lions are normally kept dry and when they leave when wet they may get too cold. A travel duration of 12 hours often happens. A final issue: external health and welfare inspections may be limited.]	Excellent provisions, esp. lots of swimming opportunities and a good filtration system. However, the requirements for keeping sea lions in the circus (lots of swimming space and filtration) is normally too expensive for a circus.	Average score: [Poor welfare] Range: [up to adequacy] Sea lions should not be kept in the circuses due to welfare problems, unless there are excellent provisions.
2	1: Travelling circuses cannot provide for the physical needs of the animals. 2: They do not meet their ecological needs… 3: their social needs… 4: their psychological needs… 5: and are unlikely to meet their physiological needs.	Not possible, keeping marine mammals in travelling circuses is simply unacceptable from an animal welfare perspective.	Average score: 1 Range: from 0 to 2 Note: my answer is “very poor”…but it is difficult to put a number (or a range) on that answer. Perhaps “unacceptable” would be a better answer.
3	1: Heat stress is probably the most serious problem facing sea lions (and any other marine mammals) in travelling shows. They are not allowed access to salt water of an appropriate temperature for sufficient hours	Possible: NO. I strongly believe it is not possible to safeguard the welfare of sea lions in circuses. They have been used in circuses for generations, but I believe their welfare in these attractions has always	I am assuming you mean overall, not on each of the five points above. I am also assuming you mean “average” or “typical” for sea lions as a species, not averaging the welfare state or score for each sea lion in a circus.

Expert	Welfare priorities	Welfare requirements	Welfare score and range
	in each day. I imagine most sea lions in travelling shows have experienced heat-related problems at some time or other. 2: There is insufficient space given to the animals to perform natural behaviours and behavioural postures or to get sufficient exercise when being transported and when being held at any venue between performances. These are animals that migrate hundreds of miles – while they spend significant amounts of time hauled out resting on dry land, they also swim for prolonged periods and travelling shows do not allow them space to get sufficient exercise. 3: There is a risk of improper food handling when animals are permanently held in what are essentially temporary quarters. The risk of frozen fish not being stored at appropriate temperatures, and also the risk of poor hygiene in temporary food preparation areas, is significant. 4: It is less likely that incompatible animals can be separated appropriately. Transport puts animals into close, cramped quarters and performance venues tend to be cramped as well. Incompatible animals must simply tolerate each other and this can lead to increased stress. 5: Veterinary care may be less rigorous and performance may be a higher priority than giving animals appropriate care and rest.	been poor and always will be. This is because, as I noted above, they are marine mammals and in travelling circuses their fundamental need for access to salt water of an appropriate temperature is denied them for a great deal of their lives. This negatively affects their welfare as a given and therefore means that even the "best" circuses are not adequately meeting their welfare needs.	Average score: I would say the average welfare score for sea lions in travelling circuses is **about 4**. They handle being in travelling shows better than any other marine mammal and possibly better than some terrestrial species, but they do not handle it well. Range: from .... to ..... I'm not sure what you mean here. If you are talking about the range of scores, then this must mean you want me to guess the scores for every circus with sea lions and I cannot do that. I don't know every travelling circus that has sea lions. However, as a general matter, I imagine there are some circuses that give their sea lions more than others – perhaps better hygiene or greater access to water between transports (they have no access to water during transport – it would be too hazardous and most if not all sea lions are transported in crates) or even better quality food and veterinary care. So there are no doubt some poorly funded circuses with scores of **0 or 1** and some higher-end circuses with scores of **6 or 7**. But none would have scores better than this – sea lions are marine mammals and in a travelling circus they are NEVER allowed adequate access to salt water of an appropriate temperature, if only because during transport they have no access to water at all.
4	1: insufficient space for a marine mammal with a wide home range (circus conditions being more confined than normal captive situations) 2: potential of contracting disease or accumulating pathogens in confinement and close proximity of a range	Possible: No	Range: from ..1.. to ..3...

Expert	Welfare priorities	Welfare requirements	Welfare score and range
	of other taxa 3: likelihood of requiring extensive antibiotic treatment for chronic rather than just acute conditions 4: appropriate nutrition may not be met, particularly where only frozen food is provided and water quality issues 5: psychological implications of keeping a wide ranging socially complex marine mammal in very confined conditions over prolonged periods, likely without any of its own social group		
5	1 Sea lions are not supposed to be in travelling circuses (not their natural habitat) 2: How can they behave in a natural way when confined in small tanks? 3 Doing unnatural tricks only to receive a reward in food? 4: Are they kept separately or together? 5: Males and females separately?	Possible: No	Average score: 2 Range: from .1... to ..3...
6	In no order of importance, and in addition to the general animal welfare problems that I consider to be universal to non-domesticated species in travelling circuses, and separate from the potential for direct cruelty: 1: Inability to access water *ad libitum* in order to actively swim and forage <u>over distance</u>. 2: Inappropriate social groupings and inability to choose social partners. 3: Repeated and frequent transport by road, including the associated inability to access a pool during transport. 4: Lack of choice and control in a complex, naturalistic environment, and housing instead in relatively small, barren and unenriched environments.	Possible: No – In my opinion, it is not possible to meet the needs of sea lions in travelling circuses.	Average score: 3 Range: from 0 to 4

Expert	Welfare priorities	Welfare requirements	Welfare score and range
	5: Inconsistent and unnatural pool water quality, and associated physical health problems.		
7 & 8	1. Sea lions need an outside pool of at least 60 m^2 for 2-4 animals 2. A night pool inside the truck. Ours is 2.50 m x 6.00 m for 4 animals. This is in accordance with the German standards (Paragraph 11 of the "Deutsche Leitlinien"). We think, these standards are quite OK. 3. Make sure, that they can use the outside pool. The best way is, that they can chose between inside pool and the outside pool. The inside pool is also important for the sunny days and when they don't want to see people. We provide salt water in the inside pool once a week. This helps prevent eye problems*. 4. A professional fish kitchen (as is standard for a Dolfinarium), freezer and refrigerator 5. Daily training sessions (as contrast program to the work in the ring) * [Further information on the relation between salt-water provisioning and chlorine usage, and whether the animals perhaps like being provided with salt water:] Sometimes we have to use chlorine in the water, together with a sand filter. It depends e.g. on the weather. The circus is travelling usually once a week. Then we only use the filter. But this is not the reason, why we have salt water once a week. This is prophylaxis against eye problems and it helps, when we have them. The animals are not more in the truck with salt water than in the freshwater pool.	See our answer to the question on welfare priorities: All the 5 points specified there are possible. For example, we believe the German Standards for sea lions in circuses are quite good (see Paragraph 11 of the "Deutsche Leitlinien"). However, even bigger outside pools would be possible. In our mind good welfare for sea lions in the circus is not more difficult or more easy to obtain as good welfare for horses in the circus.	
9	1: Environment (physical and social) 2: Transport 3: Training methods and performance	Possible: No WSPA opposes the use of animals in entertainment when such use adversely affects the animals' welfare	WSPA does not feel able to answer this question - we note that any response would be subjective, depending on the scale against which comparisons are being made.

Expert	Welfare priorities	Welfare requirements	Welfare score and range
	4: Diet 5: Health 1. **Environment** Some sea lion species are migratory, and although they tend to be relatively sedentary on land, they have evolved to make annual journeys of hundreds of thousands of kilometres through the oceans. Even for species that are not migratory, the environments they inhabit are rich in biodiversity (Rose et al., 2009). Circus animals spend the majority of the day confined to their living environment, and only about 1–9% of the day performing or training (Iossa et al., 2009).The environment sea lions are housed in whilst travelling in circuses is by necessity basic and barren, and, in physical terms, cannot simulate the vast reaches of the ocean that these animals traverse when they migrate, nor can they include in the enclosure oceanic flora and fauna (Rose et al., 2009). Sea lions often live in large social groups. California sea lions congregate in groups of dozens of animals when on land, occasionally achieving aggregations of hundreds of individuals. When in the water they float together in large 'rafts' to regulate their body temperatures. Some sea lion species are territorial or maintain dominance hierarchies; relationships with conspecifics are often very complex and can take years to develop. In travelling circuses these gregarious species are, by necessity, forced to exist in small groups, sometimes of no more than two or three individuals. Therefore, in social as well as physical terms the travelling circus environment is barren and artificial (Rose et al., 2009). In short, the travelling circus environment of these	by causing physical and/or psychological harm, including the significant suppression of natural behaviours. In specific regard to sea lions in circuses, areas of concern include their environment, transport, diet, health, and training methods for entertainment purposes, not just actual performance or competition. WSPA believes that keeping large, socially complex, naturally wide-ranging non-domesticated mammals such as sea lions in captive environments, for the purposes of entertainment, is unacceptable. We further assert that the behaviours these animals are frequently trained to perform serve no educational value, and significantly misrepresent the species, and the animals' welfare and conservation needs, to audiences. We therefore take this opportunity to urge the Dutch government to ban their use in circuses.	

Expert	Welfare priorities	Welfare requirements	Welfare score and range
	animals is profoundly limited and impoverished (Rose et al., 2009). Travelling circuses have extremely limited ability to make improvements to such housing, such as increased space, environmental enrichment and appropriate social housing. The opportunity for the intense physical activity, expressions of natural foraging behaviours, and crucial interactions with conspecifics that typify sea lions when mating or at sea, is severely compromised (Rose et al., 2009). The performance of stereotypical behaviour, frequently observed in circus animals, demonstrates the degree to which their mental health and welfare is damaged by these barren conditions (Korte et al., 2007; Iossa et al., 2009). 2. **Transport** Out of necessity, animals kept by circuses experience travel frequently. Forced movement, human handling, noise, enclosure motion and confinement constitute sources of stress to captive animals during transport (Iossa et al., 2009), and there is no reason to suggest sea lions would be exempt from such stress. 3. **Training Methods and Effects of Performance** Performing sea lions are trained to demonstrate a series of conditioned behaviours. Some of these behaviours are also naturally occurring behaviours but many are merely based on natural behaviours that have been performed out of context and exaggerated and altered almost beyond recognition. The most common training method, called operant conditioning, uses food as primary positive reinforcer. For some animals, this means that satisfaction of hunger is dependent on performing tricks; for others, hunger is deliberately induced so the reinforcer will be effective. This is not food deprivation		

Expert	Welfare priorities	Welfare requirements	Welfare score and range
	per se, for a complete food portion is ultimately provided each day, but the use of food as a reinforcer arguably reduces some animals to little more than beggars. Their lives obsessively revolve around the food presented during shows and training sessions. Patrons of any sea lion circus show can easily observe the animals' attention fixed on the buckets of food. For these animals, natural feeding and foraging rhythms and cycles, as well as independence of any kind, are lost (Rose et al., 2009). Kiley-Worthington (1990)] did not observe signs of prolonged or acute distress during observation of training in British circuses, but did observe fear and anxiety before animals became accustomed to trainers, and reported that other animals performed frustration and avoidance behaviours and refused to perform certain acts. She reported that not enough training was practised, training lacked innovation and was not always appropriate for the species, and that there were not enough good trainers. Iossa et al. (2009) state that performance in the presence of spectators may cause severe stress to non-domesticated animals, which would of course include sea lions. They note that loud noise is a well-known stressor in captive animals. In circus tigers, pacing increases in the hour leading up to performance and when the animals are on public display (Krawczel et al., 2005); stereotypy performance increases prior to performance in circus elephants (Friend, 1999). Hosey (2000) concludes that the majority of the evidence available suggests that human audiences have stressful effects on non-domesticated animals, which would include sea lions.		

Expert	Welfare priorities	Welfare requirements	Welfare score and range
	4. **Diet** There is little data available on the diet of circus animals, but bad feeding practices in captivity sometimes result in disease in circus animals which would not result in the wild (Iossa et al., 2009). For example, an instance of botulism in circus lions has been reported due to their consuming broiler chickens (Greenwood, 1985). 5. **Health** Physical restriction due to the captive environment has been reported to have an impact on circus animal health. Lack of physical exercise can result in obesity and related joint and limb defects in zoo and circus elephants (Iossa et al., 2009); there is no reason to assume sea lions would not be exposed to similar problems. Also in circus elephants, joint and hernia problems are reported due to the adoption of unnatural postures in performance (Iossa et al., 2009). One might again expect similar issues in performing sea lions, particularly as most sea lion shows are entertainment spectacles in which animals perform in a burlesque, exhibiting a series of wholly artificial tricks, such as “handstands” and balancing a ball, often while loud music is played (Rose et al., 2009). Wiesner (1986) reports tuberculosis as a common problem in circus animals in Germany. Sea lions provided with chlorinated water pools may suffer serious skin and eye complications as a result of the chlorine (Rose et al., 2009).		
10	The keeping of sea lions in the circus does not pose a threat to public safety. They are generally not aggressive towards staff or members of the public. No	Possible: Yes, certainly possible. As is being proved at present by, for example, Ingo Stiebner and Petra & Roland Duss. My 5 main requirements are:	Average score: 9.5 Range: from 8 to 9.5 Circus sea-lion trainers are very focussed on maintaining

Expert	Welfare priorities	Welfare requirements	Welfare score and range
	incidents with sea lions in European circuses have been reported in decades. Sea lions thrive in the European circus. There are often births of cubs and there is a lot of knowhow and expertise among the European sea-lion circus performers. They are regularly consulted by marine mammal parks, zoos and shelters on welfare topics and/or transport procedures. The transport of circus sea lions does not pose a threat to their welfare, as it occurs mostly during their sleeping time. Video footage of circus sea lions during transport confirms that the animals show no signs of stress at all. This is also due to the fact that they are all born/raised in captivity, most of them in the circus. Circus sea lion exhibits are adapted to the animals' specific needs. There are large outside pools (with minimal chlorine usage and natural salty water when available), dry resting areas with the opportunity to sunbathe, indoor shelters with the possibility to separate when necessary. The changing surroundings of a circus provide a variety of stimuli for the animals (smells, sights, people, climate). There is very little economical pressure on circus animal welfare as most circus sea lions are owned by the trainer and not by the circus, which means the trainer can always decide in the best interest of his/her animals. Most well run circuses prioritise animal welfare.	1: Large outside pool with minimal chlorine usage. Natural seawater when available. 2: Good quality and hygiene of fish. 3: Clear administration on every animal and fixed vets for each region where performances take place. 4: Variety in stimulation. For example, supervised interaction with the public (possibility to inform on the situation in the wild, species' characteristics, training, etc.; as now done by the Duss family during the summer season), exchange of water toys with colleagues in zoos and circuses, elaborate day routine for maximal animal welfare. 5: Dry resting place and the possibility to separate if desired by the animal or required for treatment/care. My background is not in biology or behavioural sciences, yet I take great interest in animals in captivity and more specifically in entertainment. I owe my love for animals to the circus. Thanks to encounters with animals in the circus at a very young age I learned to see their beauty and amazing natural abilities. That is why I believe circus animals are truly ambassadors for their species in the wild. I see circus as edutainment. Modern animal acts generate respect, interest and awe for animals and nature. They make a lasting impression on children of all ages, which contributes to ecological awareness. If circus animals are kept and cared for in a professional, loving way, with attention for their specific needs, then I believe circus animals will always be morally acceptable and valuable to society. It is science who gives us a rational framework to	ánd improving animal welfare. They work very hard and constantly invest time, money and effort into their animals. That is why they certainly deserve this number. There is room for improvement: even more exchange of expertise with colleagues and other facilities. Why is there no possibility to acquire membership with the EAZA? I believe both circuses and zoos can benefit from this. Regulation on a European level seems the goal to me. As the European Commission has acknowledged the circus as part of our cultural heritage and has taken the lead on other animal welfare themes in the past, this seems the natural thing to do.

Expert	Welfare priorities	Welfare requirements	Welfare score and range
		measure the welfare of animals. That is why I am very pleased Miss Dijksma ordered additional scientific research on this theme.	
11	1: Adequate health care including veterinary oversight and options for treatment and isolation 2: Adequate food, which is not always easy when the animals are moving frequently 3: Access to clean sea water sufficient to allow swimming and normal behaviours (including social behaviours (i.e. these animals should never be held without other con-specifics) 4: Adequate space for resting and protection from disturbance and aggressive conspecifics 5: Appropriate environmental conditions (temperature, light, sound)	Possible: Yes If yes (=possible), then the 5 main requirements are: 1: Frequency and comprehensiveness of veterinary care and health assessments 2: Sanitary housing, husbandry, food preparation 3: Sea water bacterial counts, clarity, temperature 4: Resting space and presence of isolation facilities meeting all above requirements 5: Ambient temperature (consistent with that experienced in the wild population), access to shade Note: The problem I think you might face is that there are numerous factors that will determine the welfare of captive sea lions, and any one of them can result in an intolerable situation. Thus, adequate protection will depend on whether measures taken are both appropriate and comprehensive.	Average score: 6 Range: from 0 to 10
12		Hiermit beziehe ich mich auf Ihre E-Mail vom 14. Dezember 2013 und auf unser Telefongespräch. Wie ich Ihnen sagte, gelten bei uns für die Robbenhaltung im Circus die sogenannten „*Leitlinien für die Haltung, Ausbildung und Nutzung von Tieren in Zirkusbetrieben oder ähnlichen Einrichtungen*“ des Bundesministeriums für Verbraucherschutz, Ernährung und Landwirtschaft. Bei Ausarbeitung dieser Leitlinien hat das Komitee darauf geachtet, dass das Wohlbefinden der Tiere (in diesem Fall der Robben) gewährleistet ist. Die im Circus gehaltenen Robbenarten (kalifornischer Seelöwe, patagonischer Seelöwe/Mähnenrobbe sowie Seebär) sind nicht	

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		unbedingt auf tiefe Wasserbecken angewiesen. Sie sind allesamt keine „Tieftaucher“, sondern sogenannte „Oberflächen-Schwimmer“. Eine Beckentiefe von 1,20 Meter wurde aus vorgenannten Gründen von dem Fachgremium, in dem ich als Sachverständiger mitgewirkt habe, bei Ausarbeitung der Leitlinien für das Wohlbefinden der Tiere als ausreichend erachtet. Wenn seitens bestimmter Tierschutzorganisationen eine Beckentiefe von 2 Meter verlangt wird, so wurde eine solche Forderung von Wissenschaftlern nicht unterstützt und nicht bestätigt. Wobei auch zu berücksichtigen ist, dass es sich bei Robben um Landsäugetiere handelt, die sich lediglich zur Futteraufnahme und zur Bewegung ins Wasser begeben. Abgesehen von den Ausführungen in den Leitlinien empfehlen wir folgendes: Das Wasser sollte ständig durch eine Umweltpumpe mit Filteranlage behandelt werden. Bei Eintrübung [i.e. clouding] sollte das Wasser sofort gewechselt werden. Die Robben im Circus werden in der Regel in Süßwasser gehalten, es empfiehlt sich aber, jedem dritten Wasserwechsel eine entsprechende Portion Salz beizugeben, was für die Augen der Tiere unbedingt erforderlich ist. Da Robben in der Obhut [i.e. care] des Menschen ihr Salzbedürfnis für den Körper nur durch die Fütterung aufnehmen können, empfiehlt es sich, Salztabletten zu füttern oder sogenannte Fish-Eater-Tabletten, in denen auch noch bestimmte Mineralien enthalten sind.	
13	1) To date much animal welfare science has been based on whether or not the animal shows evidence of	I think I have answered this more or less, but here is a little more.	I have not recently seen many, so difficult. But the ones I have seen in the last few years:

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	distress. This can now be measured (see (Kiley-Worthington, 1990)) and the animal given the benefit of any doubt. If there is evidence of distress, then the environment for that animal is wrong, the welfare of the animal is unacceptable and changes must be made. There are some cases, however, where all evidence of passed distress will not be eradicated by large scale apparent improvements in the environment (e.g. the performance of established stereotypies). The aim in such cases must be therefore to reduce evidence of distress, even if it is not possible to eradicate it. Circuses, zoos and any other type of environment where animals are kept must, if their welfare is to be above average, not just acceptable, the animals must have a life of quality. We now know enough about most species of mammal to work out how this can be achieved. This requires a 3 pronged approach: a) Application of **Conditional Anthropomorphism**. Since we are also mammals, we must take into account our common mammalian heritage and make judgements concerning whether or not these conditions might be acceptable to a human. But, such a judgement must then be (b) **moulded by our species differences**. (c) The third part of a welfare judgement **which must** be assessed, particularly for mammals since earning is one of their strong adaptive strategies, is **the lifetime experience of that individual**. In order to make a generalised estimate of species differences, the needs of that species must be understood and catered for. These can be divided into physical, social, and emotional & cognitive needs.	1) ability to swim and have a comfortable physical environment 2) an appropriate social environment where they can have positive relationships with other sentient beings, ideally with other sea lions, but depending on the past experience of the individual. Ideally, be able to breed and raise their young. 3) an ability to have plenty of experience of pleasurable emotions, involving making contact with others of their own or other species some of the time, new individuals as well as those already known, playing, showing likes and dislikes, etc. 4) in order to allow point 3, daily teaching/stimulating/enriching experiences learning different new things, either in the water or out of it, being taught cooperatively and handled well by qualified people (see the book Exploding the Myths). 5) Being able to make choices and decisions in what they do and when. Having to do some sort of "work" for their living (e.g. hunt for their food, learn to manipulate things, or do athletic activities, or demonstrate affection, etc.). 6) Particularly for the future of circuses, it is very important that acts illustrate how mentally and physically able the animals are. And that their world view is, in some respects, similar to humans but in others different. Where these differences and similarities are (e.g.: similarities: showing some genuine affection towards their keepers/presenters, and this being pointed out by a narrator. Or differences: they can smell different things and identify them under water, they can swim very fast	Score around 6-8.

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	Superimposed on these, will be knowledge of the lifetime experiences of that individual or his particular physical characteristics (e.g. if he has only one flipper, he will have different physical needs from his con-specifics, and probably a different idea of distance and space). **Related species similarities**. Since evolution is responsible for the species body and mind, there are genetic tendencies for that species to perform particular behaviours. (For example all mammal mothers look after and suckle their young and form close emotional bonds with them, therefore to take a young mammal away from his mother is likely to cause distress and suffering and should be avoided if possible.) All mammals learn and consequently can adapt to a range of conditions and have important cognitive needs. Thus in order for the animals to have a life of quality, rather than just one free of distress, whatever his environment, the animal should be able to perform "**All the behaviour within their repertoires that do not cause suffering to others**" at least until we have evidence that that species or individual's life will not be compromised if he is unable to do one of these species innate tendencies. The first step is to outline what that particular species' needs are: their physical, social, emotional and cognitive needs. 1) **Physical needs**. These include inappropriate food, amounts, quality, freshness, etc., exercise: insufficient swimming area or not encouraged to take exercise, temperature of water and landing areas acceptable to that individual (i.e. not too cold or hot for long periods). Sufficient time and comfortable physical environment to	and jump about. In this way the audience can begin to appreciate them for their special abilities and being, but at the same time be entertained, not just by a lecture. This could include illustrations of similarities and differences in various aspects of their physical, social, and emotional, cognitive needs/ lives. This means that circuses must start thinking more deeply not only about entertaining people, but also educating them on the wonders of other species before it is too late and both the circuses and the species are extinct.	

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	sleep, rest, etc. Freedom from pain and disease & proper veterinary treatment where needed. 2) **Social Needs**. Possible lack of social contact with own species, but this can depend on lifetime experiences. It may be more traumatic to introduce con-specifics to those who have lived alone for a long time. However some important social contact is essential: e.g. good and pleasant relationships with handlers, trainers, or other species of mammal to allow bonds to form, and pleasure to be experienced. For a life of quality, they should be able to breed, to have sex and maternal behaviour, and be mothered. 3) **Emotional & Cognitive needs**. Emotional needs are served by (i) not having prolonged experiences of negative emotions, such as fear, terror, anxiety, etc. (ii) experiencing a range of emotions. One of the major problems for captive mammals is to ensure that they do have an enriched emotional life, and are not just experiencing the same thing daily, ending up with cognitive and emotional needs not being fulfilled. Experiencing positive emotions is important (pleasure, joy, delight, affection, etc.) but the nature of emotions is that it is not possible to experience any emotion all the time: pleasure is experienced because it is absent some of the time. Another characteristic of emotions is that they are private. We do not know the other's feeling, we cannot feel it. But, by assessing the other's behaviour we can have at least a guideline on what he may be feeling. We now do have some ways of measuring pleasure, such as playing, both object and social play, greeting and making voluntary contact with another,		

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	showing affiliative behaviour, showing some curiosity and investigation of objects and others. *The important concern for sea lion welfare is that they do show a variety of emotions, and that these are positive emotions. They should be encouraged to experience different environments, etc.* This is often less of a problem for animals in circuses than in zoos since they experience different environments and contact with different species often, including humans. But it must be monitored if they are to have a life of quality. **Cognitive needs** are the types of needs that to date have received almost no attention from welfare scientists. To ensure the animal has a life of quality it is essential to ensure that he has enough to do and enough to think about, enough to learn and ways in which he can use this knowledge. Until very recently it was assumed that for non-human mammals, provided you fulfilled their social and physical needs, their welfare could not be questioned. It has become evident now, that frequently many species and individuals are able to make much greater adaptations to difficult or different social or physical environments than they are to those which lack cognitive stimulation. A mammal is born with the hardware to be able to acquire an enormous amount of information, he must become a good 'natural ecologist' as well as a 'good sociologist" if he is to survive and reproduce. When he is unable to make decisions, choices and acquire information, he will suffer mentally and this in turn may be reflected in physical illnesses or inadequate social behaviour. Thus it is ESSENTIAL, (and after a lifetime of studying mammalian welfare, I am now convinced) that this is often the		

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	major problem confronting most captive and domestic mammals. "Environmental enrichment" is considered to cater for this problem, but it often only begins to address it. *The sea lions and all other mammals, MUST be cognitively stimulated* and if this means learning different or new things from what they would have learnt in the wild, as long as it provides stimulation and allows the individual to make choices, decisions and develop perhaps different skills, it will be of benefit to that individual. What is quite unacceptable from the individuals point of view is not to have such stimulation, regularly. Circuses are better placed to be able to do this in their training and performing than zoos. But, their training and performing MUST continue all their lives for them to be stimulated by *learning different new things, not just repeat old ones*. My belief is that this should be written into all the keeping of captive mammals, *they must have some form of cognitive stimulation for at least 30 minutes per day*. This is to be perhaps a challenging but a pleasurable experience. See: Kiley-Worthington, M. 1990. Animals in Circuses and Zoos. Chiron's world? Kiley-Worthington M and Rendle-Worthington J. 2012. Exploding the myths. Large mammal welfare, handling and teaching. Xlibris & Amazon, UK.		

Wageningen UR Livestock Research
P.O. Box 65
8200 AB Lelystad
The Netherlands
T +31 320 23 82 38
info.livestockresearch@wur.nl
www.wageningenUR.nl/livestockresearch

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Wageningen UR Livestock Research
P.O. Box 65
8200 AB Lelystad
The Netherlands
T +31 (0)320 23 82 38
E info.livestockresearch@wur.nl
www.wageningenUR.nl/livestockresearch

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